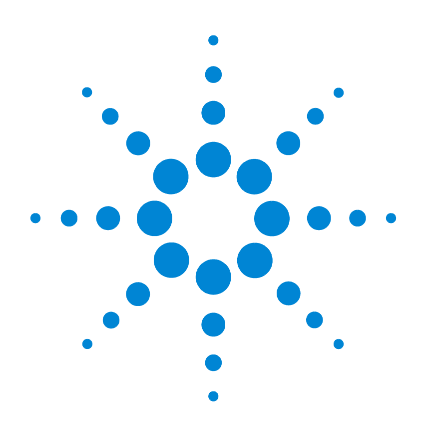




Agilent 3200P pH Meter
pH 计

User Guide
用户手册



Notices

Manual Part Number

5973-1775

Edition

First edition, March 2012

Printed in China

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Use the tools and accessories shipped with 3200P pH Meter during installation.

Tools and Components Needed for Installation

Agilent provides the special tools needed for installation. You can find the following parts in the shipping case of the pH Meter (Meter Kit).

- Electrode holder (G4389A)
- Electrode, for example P3211 pH combination electrode (5190-3988)
- Power adapter (5185-8389)

Installing the 3200P pH Meter

Open the meter kit package case. Remove the pH Meter, multifunction electrode holder, and other parts.

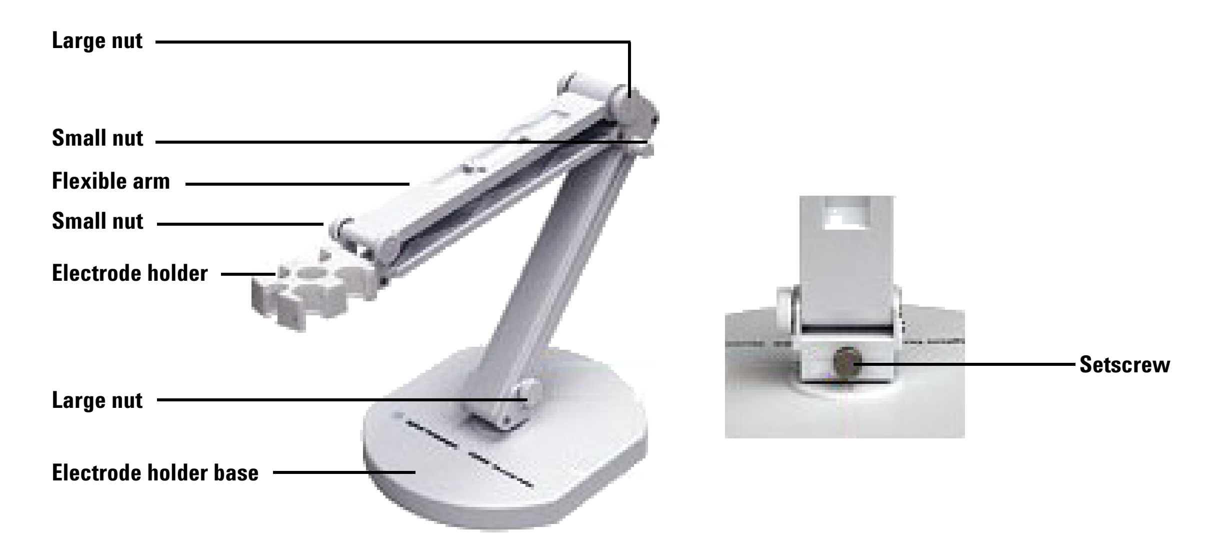


Figure 1 Installing the Electrode holder

The sockets for the pH electrode and ATC probe are on the back panel of the meter. Insert the connectors of the pH electrode and ATC probe (5190-3998) into their respective sockets. See Figure 6 on page 13. Run the electrode cables along the electrode holder as shown in Figure 2 on page 8.



Figure 2 Installing the electrodes

Installing the Power Adaptor

The universal power adapter that is included with the meter is the only power adapter recommended for use with this unit.

The external electrical power adapter is rated at 100 to 240 VAC, 1 A, 50/60 Hz.

This power adaptor provides a plug converter which supports several kinds of plugs. Choose the appropriate power plug. Connect the output plug of the power adapter to the power input on the meter. A click will be heard when the plug is properly engaged.



Figure 3 Installing the Power Adaptor

Installing the Ground Line

The meter ships with an optional ground line. During use, if another device (such as a constant temperature bath) causes electrical interference and an unstable reading, install the ground line. Connect one terminal of the ground line to the meter ground socket (⏚) and the other terminal to the interference source.

Installing the Electrochemical Data Collecting Software

The optional G4390A software provides communications between the meter and a computer. To input data to a computer, install the Electrochemical Data Collecting Software on a computer. Connect the computer to the meter with a USB cable. See the G4390A software documentation for more information.

If not using the G4390A software, Agilent provides downloadable data printing software on the Agilent Customer Portal (see “Agilent Customer Portal ” on page 15). To use this software, download it from the portal and install it. Then connect the meter to the PC using the USB cable. Refer to the data printing software documentation for more information

More Information

For more information, visit the Agilent website at http://www.agilent.com/chem. See also the instructions provided with each electrode.

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Operation

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This chapter describes how to use the 3200P pH Meter.

Introduction

The 3200M pH Meter is suitable for accurately measuring the pH value of various solutions.

During measurement, the LCD display shows the current state of the 3200P pH Meter. During measurement, you can also change the displayed parameters.

The 3200P pH Meter is composed of a meter body and an electrode system. The electrode system shown in Figure 4 includes a pH combination electrode and an ATC probe.

See Figure 4, Figure 5, and Figure 6.



Figure 4 Major parts of the pH 3200P system



Figure 5 Front view of the pH 3200P Meter

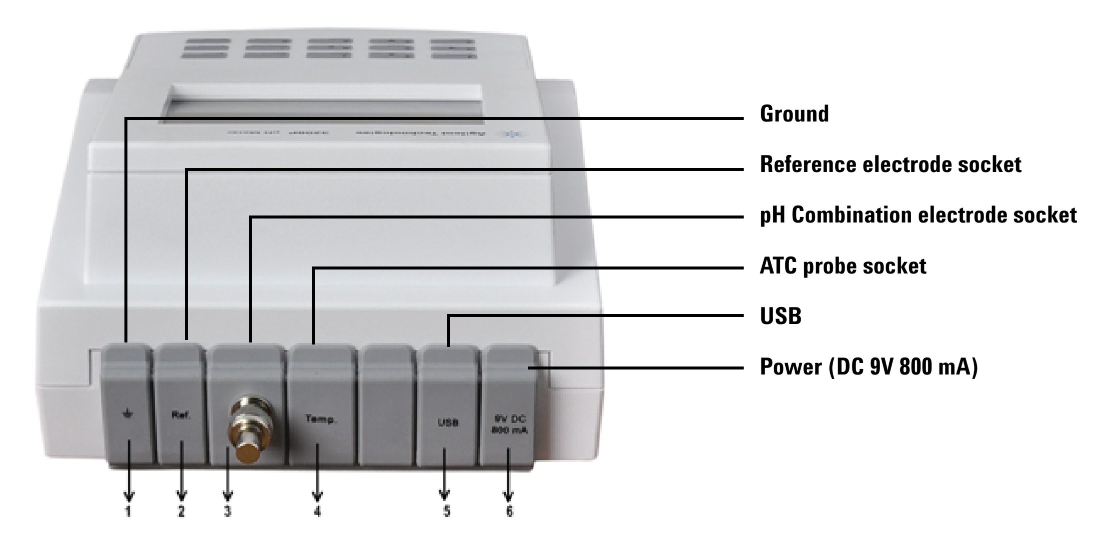


Figure 6 Back view of the pH 3200P Meter

Safety Information

Before operating your meter, be sure to read the installation and operation instructions.

The most common safety issues when working with the meter include:

- Using any power source other than the original power adaptor may produce some safety problems.
- Be sure that the meter has a good ground connection.
- Prevent exposure to corrosive gases.
- Keep the sockets of the meter clean and dry. Avoid contact with acidic, alkaline, and salt solutions.
- The meter can be used continuously for a long time. After a measurement, soak all electrodes in distilled water.
- To protect high resistance components from damage, install the short circuit plug (G4383-40000) onto the pH electrode socket when the meter is not connected to a pH electrode. (The short-circuit plug ships installed in the pH socket of the meter, see Figure 6.) Keep the short-circuit plug clean and dry. The plug can be damaged by humidity. A damaged short-circuit plug can damage the meter.

Agilent Customer Portal

Agilent also provides customized information for the products you own through a customer portal. This web service provides many customizable services as well as information related directly to your Agilent products and orders. Log onto the portal at ***http://www.agilent.com/chem***.

Term Definitions

pH Slope	The mV variation of each unit of pH represented by mV/pH or percent (%) theoretical slope
pH E_0	Also called *Zero Potential* and is the mV value at pH 7
One-point pH Calibration	Calibration with one pH buffer
Multi-point pH Calibration	Calibration with more than one pH buffer

Features

The 3200P pH Meter is a state-of-the-art and customer-friendly benchtop analytical instrument, designed for the measurement of pH, potential (mV), and temperature in aqueous solutions. It features:

- Measurement of pH, potential (mV), and temperature
- Automatic pH buffer recognition for buffers prepared according to NIST, DIN and GB standards
- Supports multi-point calibration (up to five point calibration)
- LCD display
- Supports GLP:
  - Requires setting an operator number
  - Records all measurements
  - Records, views and prints calibration data
  - All saved data meets GLP. Stores a maximum of 200 sets of measurement data
- Can view, print and delete stored measurement data
- Supports three measuring modes: Continuous Mode, Timed Reading, and Auto-Lock Mode
- A USB port can be connected to a PC when using the optional G3490A software.
- When the meter is powered off, the stored measuring data, calibrated data, and setting parameters will not be lost.
- Can turn itself off to conserve power
- Provides self-diagnostic messages and functions to support troubleshooting issues that occur
- Provides LCD back lighting for use under dim lighting conditions
- Meter firmware can be updated for any new features or bug fixes that arise.

Specifications

The major specifications of the 3200P pH Meter include measuring range, resolution, accuracy of the electronics, normal working conditions, size and weight.

Measurement range

pH: –2.000 to 20.000
mV: –1999.9 mV to 1999.9 mV
Temperature: –5.0 to 110.0 °C

Resolution

pH: ± 0.1/0.01/0.001 pH/pX
mV: ± 0.1 mV
Temperature: ± 0.1 °C

Accuracy

pH: ± 0.002
mV: ± 0.03% full scale
Temperature: ± 0.1 °C

Normal operating conditions

Ambient (environment) temperature: 0 to 40 °C
Corresponding humidity: ≤85%
Power supply: Power adaptor (5185-8389)
Power input: 100 to 240 VAC, 1 A
Power output: 9 VDC, 1 A
No performance-affecting vibrations nearby
No corrosive gases in ambient air
No strong electromagnetic interference
Size (mm): 190 length × 190 width × 105 height
Weight (kg): approximately 1 kg

The Operating Panel

Display

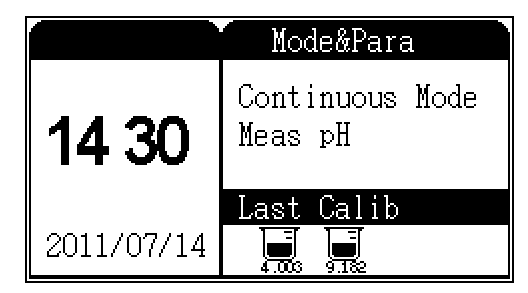


Figure 7 The display

The display shows the working condition and current setting of the 3200P pH Meter. After the power supply is connected, press **[On/Off]** to turn on the meter. After a successful power up, the meter model, version number, and other information displays. After the system self-check, the meter goes to the initial state as shown in Figure 7. The left side of the screen shows current system time and the right side shows the current measuring mode, parameters, and the last calibration data.

Keypad

The meter has 15 operating keys. The keys are shown in Figure 8 on page 20 and described in Table 1 on page 20. Most keys have two values, a numeric entry and a function. Which one applies depends on the display; if it is waiting for a number, the numeric entry applies, otherwise, the function applies. To complete a numeric entry, press **[Enter]**.

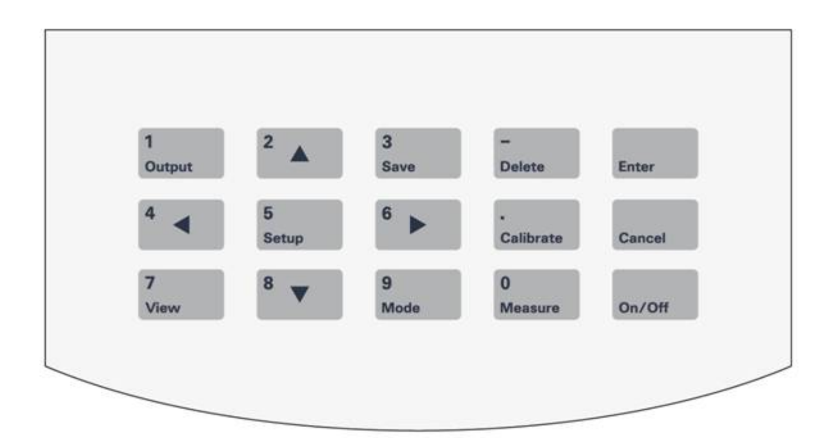


Figure 8 Operating keys

Table 1 Key values

Key symbol	Numeric entry	Function
1/Output	1	Output presently displayed data
2/▲	2	Move up or select mode
3/Save	3	Store measuring data
4/◀	4	Move left
5/Setup	5	Set different function
6/▶	6	Move right
7/View	7	View stored or calibrated data
8/▼	8	Move down or select mode
9/Mode	9	Switch display window or parameter in measuring state
0/Measure	0	Begin measurement in initial state
–/Delete	– (negative number)	Delete function Can delete saved data when you view them.
./Calibrate	. (decimal point)	Calibrate electrode
Enter		Enter
Cancel		Cancel
On/Off		Turn meter on or off

Instrument control

The 3200P pH Meter is usually controlled by the keypad. It can also be controlled through a computer using the optional G4390A software. For details on how to use the optional data collecting software, see the information provided with the software.

Setting Up the pH Meter

This section describes the tasks that an operator will perform when starting up the 3200P pH Meter.

Using the meter involves:

1. Selecting the measurement mode and the display parameters.
2. Preparing the electrode.
3. Measuring the pH.

To start up the 3200P pH Meter

Always operate the meter in an environment that meets the requirements listed in "Normal operating conditions" on page 18.

1. Connect the meter to the power supply.
2. Ensure the meter has a good ground.
3. Check the electrode connector and meter socket. The electrode must have a reliable connection.
4. Press **[On/Off]** to turn the meter on.

The initial state of the meter is shown in Figure 9. The left side shows the system time. The right side shows the setting, measuring mode, pH parameter, and the last calibration data.

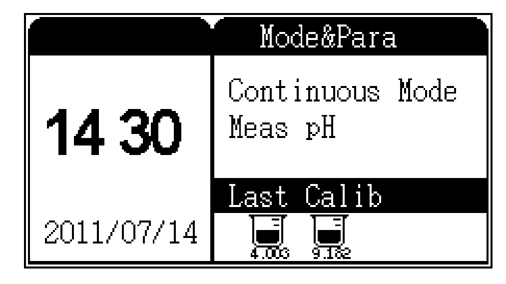


Figure 9 Function setup in the initial state

Accessing setup parameters

From the initial state display, press **[Setup]** to display a menu with choices to define system parameters (date, time, temperature, and so forth) or select the measuring mode. Choices include: **Measuring Mode**, **System Setup**, **Language select**, **Set Manual Temp**, and **Set Condition**. See Figure 10.

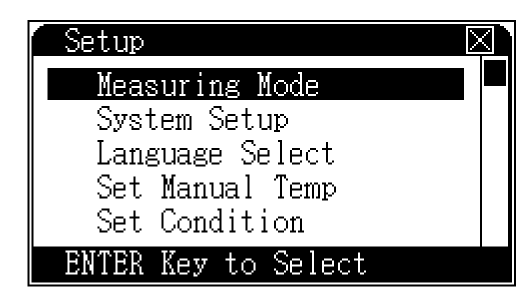


Figure 10 The setup menu

To make a selection, use the arrow keys to highlight the desired parameter, then press **[Enter]** to view its settings. Press **[Cancel]** to exit.

[Measuring Mode]

Select to set the measuring mode used when taking measurements: Continuous Mode, Timed Reading (Timed Reading Mode), Auto-Lock Mode (Auto-Lock Reading Mode). See “To select a measuring mode” on page 25.

[Set Manual Temp]

Select to manually enter the current sample solution temperature. If the meter is not connected with an ATC probe, the temperature value must be input manually. Otherwise, the meter uses the ATC probe value. See “To manually set the solution temperature” on page 27.

[Set Condition]

Select this mode to enter an Auto-Lock condition in Auto-Lock reading mode. See “To set a condition for Auto-Lock mode” on page 28.

[System Setup]

Set up system time and GLP Standard. See “To set up the system (System Setup)” on page 29.

[Language Select]

Supports Chinese and English version. See “To select the display language” on page 31.

[Auto Power Off]

Supports the function of turning off automatically. See “To set the meter to turn off automatically (Auto Power Off)” on page 31.

[Set Default]

Select to delete all custom settings and restore the factory default settings. See “To restore factory defaults (Set Default)” on page 54.

To select a measuring mode

The meter supports three measuring modes: **Continuous Mode**, **Timed Reading**, and **Auto-Lock Mode**. After selecting a parameter and measuring mode, the next measurement will use the new settings.

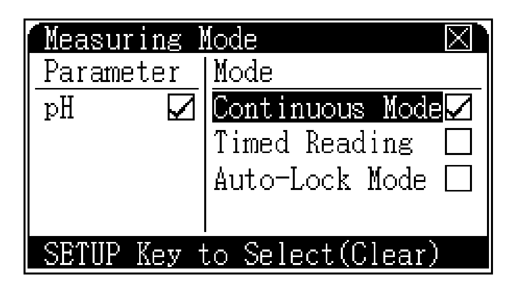


Figure 11 Measuring mode

To select a measuring mode:

1 Press **[Setup]** and then **[Enter]**. The meter displays is similar to Figure 11. The left side displays parameters. The right side lists the measuring modes. A √ next to a mode means that this mode has been selected in the current setup.

2 Use the arrow keys to highlight the desired mode.

3 Press **[Setup]** to select the highlighted mode.

4 Press **[Enter]** to save the new setup, exit the **Setup** mode, and return to the initial state.

Press **[Cancel]** to exit the **Setup** mode without saving changes.

Measuring modes

Continuous mode

This is the most commonly used measuring mode. The meter performs the measurement and calculates and displays the result continuously. You can view the calibrated parameter, calibrate the electrode, and save or output the result during the measurement. After measurement, press **[Cancel]** and then **[Enter]** to exit the measuring mode.

Timed Reading mode

In this mode, the meter continuously measures the pH for a specified period of time. For example, to measure pH continuously for 30 minutes, select this mode and set the time interval to **30**. When measurement begins, the meter continuously displays the results of measurements and calculations. When the set time period ends, the meter saves the measuring data. (If the USB interface is connected to a PC, the meter also prints out the measurement data). Then the meter begins the next measurement automatically. To stop measurement, press **[Cancel]** and then **[Enter]**.

In this mode, you enter the desired time interval. The default value for the time interval is 10 minutes. The range is 1 to 99 minutes.

Auto-Lock Reading mode (Auto-Lock mode)

Auto-Lock mode requires that you set a condition as described in ““To set a condition for Auto-Lock mode” on page 28. When measurement begins, the meter continuously displays the results of measurements and calculations until the measurements meet the preset Auto-Lock conditions, at which point the measurement ends.

During a measurement in this mode, you can view measuring parameters, calibrate the electrode, and so forth. After measurement ends, you can save and output the results.

Press **[Cancel]** to exit this mode or press **[Measure]** to begin the next measurement.

To manually set the solution temperature

If using an ATC probe (an ATC probe is connected to the meter), the meter uses the temperature data from the probe. Otherwise, the user must enter the temperature value of the sample solution.

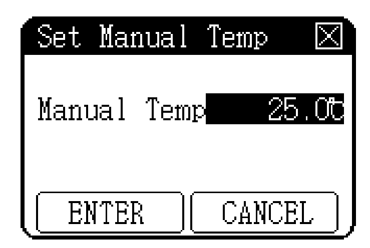


Figure 12 Entering temperature

1 Press **[Setup]** and select **Set Manual Temp**.
2 Enter the temperature in the dialog.

To set a condition for Auto-Lock mode

In Auto-Lock mode (only), **Set Condition** is used to set the termination conditions for measuring the pH. The meter measures the pH until the condition is met and is stable for the duration specified in **Auto-Lock Time**.

For example, Figure 13 shows that the condition for pH is **0.010pH**. When the pH measurement stabilizes within ±0.01 pH, and remains stable for the **Auto-Lock Time** of 5 seconds, measurement ends.

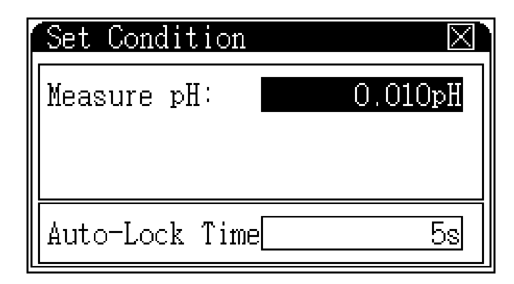


Figure 13 Setting a condition

The valid time range is 1 to 200 seconds.

To set up the system (System Setup)

System setup includes the following items:

Calib Interval — **Calib Interval** is the time interval between recalibration prompts. The meter counts the time since the last calibration and if the time counted exceeds the entered calibration time interval, the meter displays a popup window to remind the user to recalibrate the electrode. **Calib Interval** is measured in hours. Input zero (0) hours to disable.

Operator No — **Operator No** is a three-digit number in the range 000 to 200. Every set of recorded data contains the **Operator No.** field. This field is used to record the operator performing measurements for regulated (GLP) laboratories. If you need to track the operator, assign a unique number for each operator.

Time — System time and date. See "To set the date and time" on page 30.

Auto Delete — Enable to automatically overwrite the oldest stored data entries with new data if the data storage is full.

1 Press **[Setup]**.
2 Select **System Setup**, and press **[Enter]** to enter **System Setup**. See Figure 14.

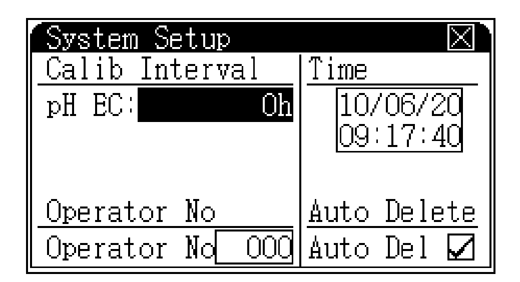


Figure 14 System setup

3 Use the arrow keys to select the desired parameter.
4 Press **[Setup]** to modify the corresponding parameter. Enter the new setting using the keypad.
5 Press **[Enter]** to save the change, exit **System Setup**, and return to the initial state.

CAUTION

The Auto Delete function is designed for cases when stored data reaches the limit of the memory of the meter, which allows you to choose whether to automatically overwrite the old data with the new data. For example, the meter stores up to 200 sets of data. When the user wants to store the 201st set of data and Auto Delete is checked, the meter deletes the first set of data and stores the 201st data. If **Auto Delete** is disabled, the new data will not be stored.

If the **Auto Delete** function is disabled, the meter will remind the user to store new data when the meter runs out of memory

To set the date and time

1 From the system setup screen, select **Time**.
2 Press **[Setup]** to open a data entry window as shown in Figure 15 on page 31.

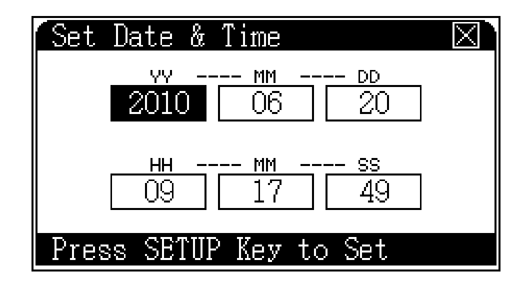


Figure 15 Set date and time

This window displays current time setup including year, month, day, hour, minute, and second. To modify the time setup, use the arrow keys to highlight the proper time cell, then press **[Setup]** and input the correct value. Press **[Enter]** to save. When all changes have been made, press **[Enter]** to save the final setup. Press **[Cancel]** to exit from **System Setup**.

To select the display language

The meter can display either Chinese or English text. To select the preferred language, from the initial state press **[Setup]**. Choose **Language Select** and then select either Chinese or English.

To set the meter to turn off automatically (Auto Power Off)

This meter can automatically turn off after a specified period of time. You can set a time period for **Auto Power Off** from 10–480 minutes. When the meter has run for the length of time that equals to **Auto Power Off** setpoint, the meter will be forced to be power off.

To disable **Auto Power Off**, set the time period to zero (0). When the meter is controlled using the optional G4390A software, **Auto Power Off** is disabled.

Using the pH Meter

For best accuracy, perform the following procedures before making measurements.

To prepare an electrode for use

A new electrode should be stored wet in the reference filling solution (5190-0545) and should be in working condition when received. Used electrodes should be stored as described in "Electrode storage" on page 59.

1 Check the electrode for any mechanical damage. If the storage bottle is dry, soak the electrode in reference filling solution for at least 2 hours before use.

2 Take the storage bottle off and keep it for future use.

3 Check the measuring tip for solidified electrolyte. If present, rinse off with distilled or deionized water.

4 Unplug the filling hole and add new reference filling solution if necessary. Fill to at least 20 mm higher than the level of sample. The liquid junction must be immersed completely in solution.

   - To guarantee the movement of reference filling solution during measurement, keep the filling hole open during measurement.

5 Hold the electrode measuring tip downwards and swing it several times to remove air bubbles near the sensitive glass bulb.

6 Install the electrode into the electrode holder as shown in Figure 2 on page 8. Put the electrode in the solution with the measuring tip downwards.

   Do not remove the short-circuit plug until after adjusting mv zero.

To adjust mV zero

Although the meter compensates for many factors which may affect measurement (such as temperature), it still can not guarantee the ideal condition of zero drift. For accurate measurement, perform **Adjust mV Zero** before measurement.

To adjust mV zero:

1 Turn off the meter.
2 Adjusting the zero requires the short-circuit plug (G4383-40000). If needed, disconnect the electrode and install the short circuit plug into the pH socket.
3 Turn on the meter and let stabilize for 30 seconds.
4 Press **[Setup]**, select **Adjust mV Zero**, and press **[Enter]**. The meter will display **Adjust mV zero?**.
5 Press **[Enter]** and the meter will calibrate mV zero.

If the potential (mV) value deviates far from zero, double check the short circuit plug connection.

After adjusting the mV zero, connect the electrode to the meter. Store the short-circuit plug in a clean, dry place. Damage to the plug can damage the meter.

To select the pH Buffer Group

The meter provides auto-recognition, to recognize several buffer groups which are prepared according to either the NIST standard, the DIN standard, or the GB standard. Each group contains several buffers.

Table 2 Buffer groups

Buffer pH	NIST group	DIN group	GB group
1.677	●		
1.680		●	●
3.557		●	
3.559			●
3.775		●	
4.003			●
4.008	●	●	
6.864	●		●
6.865		●	
7.000	●	●	
7.409			●
7.416	●	●	
9.182			●
9.184		●	
10.014	●	●	
12.454		●	
12.460			●
12.469	●		

For each Buffer Group Setup, you may select up to five buffers. Since the pH range of a buffer may overlap with the pH range of another buffer in the same buffer group, the meter limits the selection of two or more buffers with overlapping pH ranges.

To select a buffer group:

1 View the last pH calibrated data. See "To view last calibrated data" on page 45.

2 Press **[Setup]** to enter **Group Setup** as shown in Figure 16.

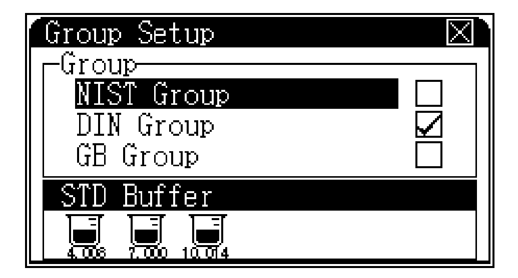


Figure 16 Group setup

Figure 16 indicates that the current Buffer Group Setup meets the DIN standard. The upper area displays the three buffer groups and the bottom area displays the buffers included in the selected buffer group.

3 Use the arrow keys to highlight the target buffer group and press **[Setup]**. The display is shown in Figure 17.

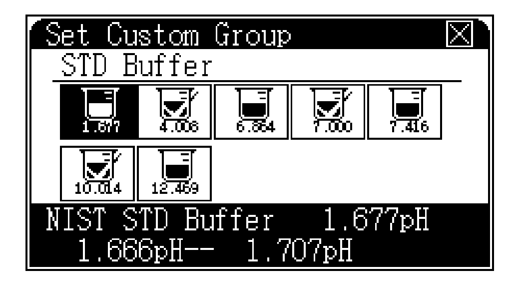


Figure 17 Modifying a buffer

It shows icons corresponding to buffers in the NIST Buffer Group. Icons with √ indicate a selected buffer. Icons without √ indicate that this buffer is available but not selected. The bottom part of the display shows the pH value and the range of the highlighted buffer.

4 Use the arrow keys to highlight the target buffer, then press **[Setup]** to select or deselect it.

For example, to select the 4.008 pH buffer, use the arrow keys to highlight the icon with 4.008 pH. Press **[Setup]** and this icon is selected.

To prevent selecting buffers with overlapping pH ranges, select only buffers necessary for measurement and clear selection of other buffers.

The meter allows selection of up to five buffers for each Buffer Group Setup.

To calibrate pH electrode (Calib pH EC)

Before each measurement, Agilent recommends recalibrating the electrode. Calibration overwrites the previous calibration data.

Recalibrate the electrode regularly. To set a calibration reminder, see “To set up the system (System Setup)” on page 29.

To perform the calibration:

1 If not connected, connect the electrode to the meter. Store the short-circuit plug in a clean, dry place.

2 View that the desired buffers have been set up in the desired buffer group.

3 The display for pH calibration is shown in Figure 18 on page 37. The upper area shows the current pH, potential and temperature value (in this example the slope is set to 100.00%). The bottom area shows the current calibration data (if any).

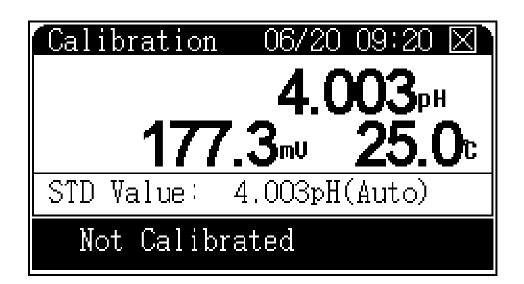


Figure 18 Calibration

4 Prepare one to five buffers. They can be purchased or can be prepared by you. Place them in a constant temperature environment to equilibrate.

5 View the pH calibration data. See "To view last calibrated data" on page 45.

6 Press **[Setup]** and select the pH buffer group. See "To select the pH Buffer Group" on page 34.

7 Return to the **Setup** window. Scroll to **Set Config Type** and press **[Enter]**.

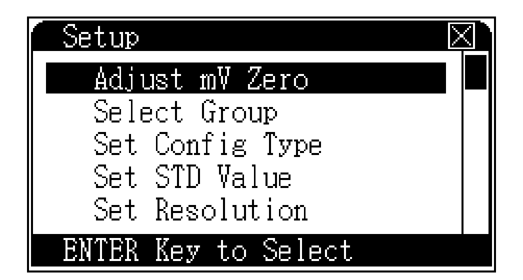


Figure 19 Calibration setup

8 If using standard buffers from within a group, select **Auto-recognition**. Matched with the proper Select Group, the meter will automatically recognize these buffers. If the

meter can not recognize a buffer, it will prompt with **Calibration error**.

If you have created and are using a custom buffer, select **Manual Recognition**. You will manually input the pH of the selected buffer at the selected temperature.

9 Return to the **Setup** window.

10 Clean the pH electrode, reference electrode, and ATC probe. Place them in the buffer to be calibrated.

11 Press **[Measure]**. The meter will be ready to take a calibration reading for the first buffer solution selected in the buffer group.

12 When the reading becomes stable, press **[Enter]**. The meter will display **Storing......** and save the calibration data.

13 After a few seconds, the meter will display a **Continue?** prompt window. To calibrate other buffers, select the next buffer to continue. Then repeat the measurement and save procedures. At any time during calibration, press **[Cancel]** to end calibration.

For example, to calibrate the electrode with 4.003 pH and 9.182 pH buffers, you must have selected 4.003 pH and 9.182 pH buffers in the Buffer Group Setup, otherwise the meter will not automatically recognize these two buffers. Even worse, it may lead to the wrong calibration.

The meter supports up to five calibration points. When the fifth buffer is calibrated, the meter will prompt to end calibration.

For buffers such as 6.864 pH and 7.000 pH which have overlapping pH ranges, we recommend the following calibration method.

- When you calibrate the 6.864 pH buffer, set the buffer group to contain only 6.864 pH, then calibrate it. Reset the buffer group to contain only 7.000 pH, then calibrate it.
- You could also use the manual recognition method, in which you manually input the pH of the selected buffer at the selected temperature.

You can use both auto- and manual recognition to calibrate the electrode to the buffer solutions in use.

To measure pH value

NOTE If sure that the meter has been recently calibrated and zeroed, you can simply start taking measurements.

1 Before measuring pH, adjust mV zero. See “To adjust mV zero” on page 33.
2 Calibrate the meter. See “To calibrate pH electrode (Calib pH EC)” on page 36.
3 From the initial state display, press **[Setup]** and select a measuring mode. See “To select a measuring mode” on page 25.
4 Press **[Measure]** to start taking a measurement according to the selected mode. See Figure 20. The upper area of the screen shows the current measuring mode and system time. The central area of the screen shows pH, potential and temperature.

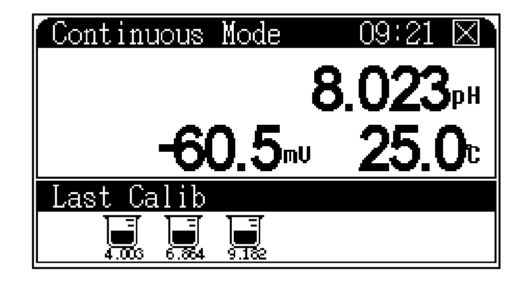


Figure 20 Enter continuous mode

During measurement, you can recalibrate the electrode, set parameters, and select the pH display resolution. After measurement, press **[Save]** to save data, **[Output]** to output data, or **[Cancel]** to end measurement.

To measure mV value

In any measuring mode, the meter always displays the current pH and mV value.

To measure temperature

In any measuring mode, the meter will display the current temperature value.

To turn off the 3200P pH Meter

After using the meter, ensure you have pressed **[Save]** to save data. Then, press **[On/Off]** to turn off the meter.

When not in use, all electrodes should be soaked in distilled water. If the meter is out of use for a long time, do the following:

- Disconnect the power adaptor from the power line to avoid damaging the power adaptor and the meter.
- The socket of the meter must be kept clean and dry. Avoid contact of the socket with acidic, alkaline, and salt solution.
- If disconnecting the pH electrode, install the short-circuit plug onto the meter to prevent damage to the meter.
- Store the electrode in reference filling solution. For refillable electrodes, plug the filling hole. If the electrode is out of use for a long time, put it back in the box and store it at ambient temperature.

Storing Data

The meter can save up to 200 sets of pH data. When the meter saves data depends on the measuring mode. In **Continuous Mode** and **Auto-Lock Mode**, press **[Save]** to save data when the readings become stable. In **Timed Reading** mode, the meter will automatically save measurement data after the measurement time expires. (Data can always be saved manually.)

To delete saved data

The meter can both save and delete data. Inaccurate or unwanted data can be deleted individually or all at once.

1 From the initial or measuring mode, press **[View]** to display data.

2 Scroll to the data to delete, then press **[Delete]**.

To output data

There are two ways to output current measurements, calibration data or saved data. One method is to use optional G4390A the data collecting software with the meter.

The other method is to use the free Data Printing Software.

1 Connect the meter to the PC with a USB cable, and run the software.

2 Press the **[Output]** key during measurement, while viewing calibration or stored data. This allows the user to print the corresponding data. Refer to the software operating instructions for details.

See “Installing the Electrochemical Data Collecting Software” on page 10.

Viewing Parameters During Measurement

During a measurement, the selected parameter automatically displays in the measurement window.

Figure 21 shows the measuring mode on the screen displayed with the parameter and measuring mode the user has chosen.

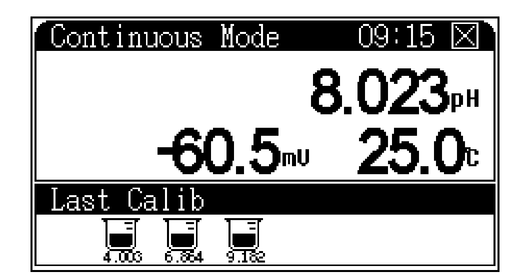


Figure 21 Continuous mode display

You can also view other parameters during a measurement. To view other parameter values, press **[Mode]** and the display will highlight the measuring window (see Figure 22). Press [4/◀] or [6/▶] repeatedly to switch parameters. When you stop pressing [4/◀] or [6/▶] for more than a few seconds, the meter automatically returns to the normal measuring mode display.

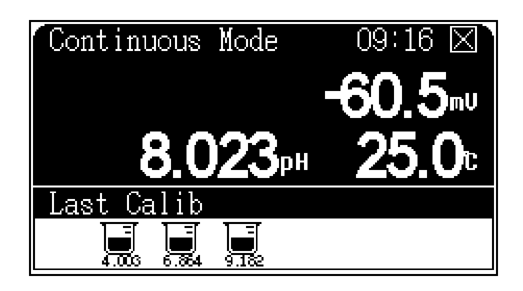


Figure 22 Switching parameters

To view saved data

The 3200P pH Meter lets you view the last calibrated data and stored data.

1 From the initial state display or measuring mode, press **[View]** and select **View Saved pH** as shown in Figure 23.

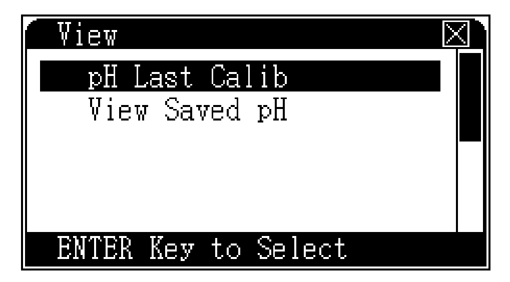


Figure 23 View menu

2 For saved data, use the scroll keys to select the data to view. Figure 24 shows example saved data:

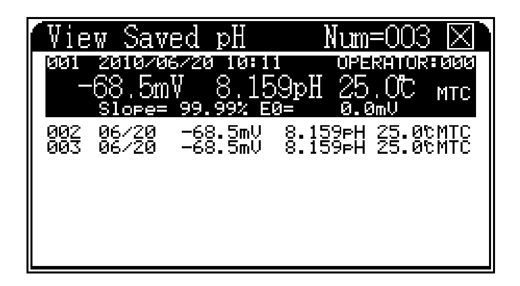


Figure 24 View saved data menu

The upper area displays the current viewing mode and actual stored amount. Each page can display 10 saved data. The display format varies with different viewing modes. The data displayed include **Save time** and **Operator No**.

3 If desired, press **[Output]** or **[Delete]** to print or delete data respectively. The output format is shown in Figure 25 on page 44. To access the output for either of these functions, the meter must first be connected to the PC.

```
========================
MODEL
                   3200P
                PH METER
SOFT VERSION
                VER 1.00
PRINT TIME
                10:25:42
              2010/06/20
OPERATOR NO
                     000
************************
STORED NUM:          003
************************
                  NO:001
OPERATOR NO:         000
STORED TIME:    10:19:00
              2010/06/20
SLOPE:            99.99%
E0:              -0.0mV

POTENTIAL:       -68.5mV
pH:              8.159pH
TEMP:              25.0c
TC.TYPE:             MTC
************************
                  NO:002
OPERATOR NO:         000
STORED TIME:    10:19:00
              2010/06/20
SLOPE:            99.99%
E0:              -0.0mV

POTENTIAL:       -68.5mV
pH:              8.159pH
TEMP:              25.0c
TC.TYPE:             MTC
************************
                  NO:003
OPERATOR NO:         000
STORED TIME:    10:19:00
              2010/06/20
SLOPE:            99.99%
E0:              -0.0mV

POTENTIAL:       -68.5mV
pH:              8.159pH
TEMP:              25.0c
TC.TYPE:             MTC
========================
```

Figure 25 Output format

To view last calibrated data

From the initial state display or measuring mode, press **[View]** and select **pH Last Calib** (last calibrated data) as shown in Figure 26.

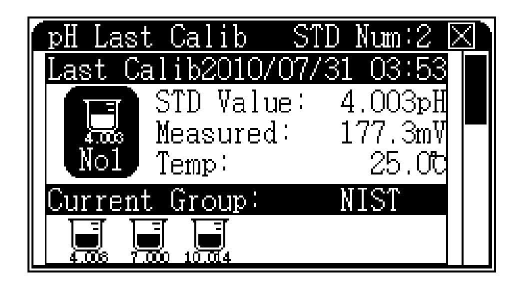


Figure 26 View pH Last Calib Data

Figure 27 shows an example.

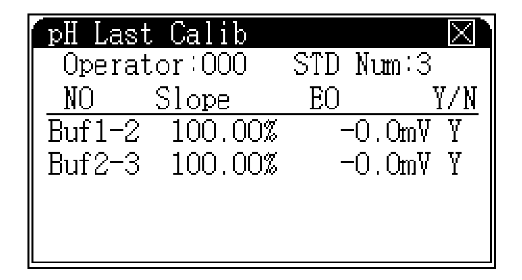


Figure 27 View pH Last Calib Data

The upper area shows the last calibrated data. The bottom area shows the current buffer groups. Press the arrow keys to view detailed calibrated data.

To print current calibration data, connect the meter to the PC with a USB cable and press **[Output]**. See also“To output data” on page 41. The printout format is shown in Figure 28 on page 46.

```
========================
MODEL
                   3200P
                PH METER
VERSION
                VER 1.00
PRINT TIME
                10:11:27
              2010/06/20
OPERATOR NO
                     000
************************
PH CALIB DATA
CALIB TIME:     08:12:00
              2008/06/01
OPERATOR NO:         000

                 POINT 1
pH:              4.003pH
POTENTIAL:       177.3mV
TEMP:              25.0c
************************
                 POINT 2
pH:              6.864pH
POTENTIAL:         8.0mV
TEMP:              25.0c
************************
                 POINT 3
pH:              9.182pH
POTENTIAL:      -129.1mV
TEMP:              25.0c
************************
CALIB RESULT
SLOPE 1:         100.00%
E0 1:             -0.0mV
SLOPE 2:         100.00%
E0 2:             -0.0mV
========================
```

Figure 28 Printout format

Software Operation

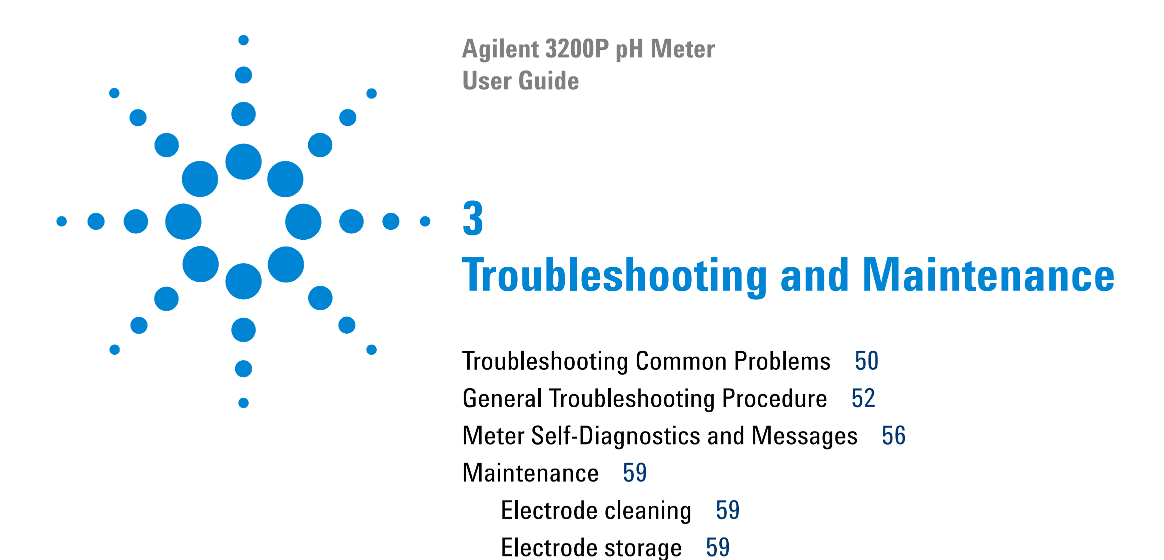
To install the software

Agilent offers the optional Electrochemical Data Collecting Software (G4390A) for communication between the 3200P pH Meter and a PC.

To install the optional software, insert the DVD into your PC drive, then follow the instructions displayed on the computer for installing. After installation, open the software from a desktop icon or from the Start menu.

To run software

1. Turn on the meter.
2. Connect the meter to the computer using the USB cable.
3. Start the software. The software will recognize meter model and type. and provide corresponding functions. Refer to the software documentation.



3
Troubleshooting and Maintenance

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Maintenance 59
    Electrode cleaning 59
    Electrode storage 59
    Consumables and replacement parts 60

This chapter describes how to verify whether the meter is working properly and how to maintain the meter.



Troubleshooting Common Problems

Table 3 lists common problems, possible causes, and how to resolve them.

Note that improper operation of the electrode will lead to abnormal readings. During measurement, soak the electrode tip completely in solution. The location of the electrode in the solution should have good mobility.

Table 3 3200P pH Meter troubleshooting

Number	Failure mode	Failure cause	Solutions
1	No display after meter starts up. The display is not lit up.	**1** Power adaptor not installed correctly. **2** The power supply does not meet with the requirements. **3** The power adaptor is damaged. **4** The power socket has poor contact. **5** The LCD is damaged (After start up for a few minutes, the user can hear a buzzing sound after pressing **[On/Off]** key, but there is no display on LCD.)	**1** Reconnect. **2** Use the required power supply. **3** Replace the power adaptor. **4** Ensure there is a good contact. **5** Contact Customer Service.
2	Display is dim.		**1** Check the power adapter.
3	No buzzing when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The buzzer has been damaged.	**1** The buzzer only sounds when you press a valid key.
4	No response when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The key has been damaged.	**1** Press the valid key for operation.
5	Meter does not display 25 °C when ATC probe is not connected with meter.	When the meter is not connected with a ATC probe, the meter will automatically switch to manual temperature setting.	Manually input the correct solution temperature.

Table 3 3200P pH Meter troubleshooting (continued)

Number	Failure mode	Failure cause	Solutions
6	The reading is not stable after a long time.	**1** The electrode has been damaged or aged. **2** There is strong electrical signal interference source nearby (electrical leaking, strong electro-magnetic field, etc.).	**1** Replace the electrode. **2** Remove the electrical signal interference source. Lift or move the beaker away from the source of interference. Shield the meter and beaker from the electromagnetic field. Use the ground line. For the ground wire, one terminal is connected with the meter and the other terminal is connected with interference source.

General Troubleshooting Procedure

During the use of the meter, there are many factors that may affect the measurement, including the electrode, the standard solutions used to calibrate electrode, the sample solution, the temperature during measurement, incorrect operation, or use, and so forth. When the measured results are significantly different from what was expected, first determine whether the meter itself or factors other than the meter caused the error. Follow the suggestions described below to diagnose the problem. Since there are multiple measuring methods, you will need to diagnose the meter based on your application conditions.

Diagnose whether the errors are caused by meter hardware, electrode calibration data error, parameter errors, or other errors, including the sample solution, solution preparation, buffer solutions used for calibration, and so forth.

For factors other than the meter, compare measurement results between known solutions. Put the electrode in different standard solutions. Check the corresponding potential (mV) value and pH value. Based on the comparison, judge whether the deviation is resulted from the electrode, the solution, or something else.

Check the temperature measurement

Because temperature measurements are used for all measurements, always ensure temperature measuring is functioning well.

Connect the ATC temperature diagnostic tool (5185-8390) to the meter. Turn on the meter to enter into measurement state. With the ATC temperature diagnostic tool connected, the meter should display a temperature reading between 49.0 to 51.0 °C. If yes, the meter is correctly measuring temperature. If the meter displays a temperature reading significantly different from 50 °C, there is a problem with the meter. Contact Agilent service.

Check the potential (mV) value

Disconnect the pH electrode. Install the short circuit plug (G4383-40000, shipped with the meter) into the pH/pX socket. Turn on the meter. Enter the pH measurement state. At this moment, the meter should display a potential (mV) reading between –0.5 to 0.5 mV (also called mV Zero). If yes, this indicates that the meter is functioning properly. If the potential (mV) reading significantly deviates from zero, then use the Adjust mV Zero function to adjust mV Zero. See "To adjust mV zero" on page 33 for more information. After adjustment, the potential (mV) reading should be near to zero. If the potential value (mV) reading cannot be adjusted near to zero by the mV Zero adjustment, this indicates a problem with the meter. Contact Agilent service.

Check the pH value

Disconnect the ATC probe. Set up the meter as manual temperature input. See "To manually set the solution temperature" on page 27. Set the solution temperature to 25 °C. When the potential (mV) is zero, the meter should display a pH reading among 6.99 to 7.01 pH. If yes, this indicates the electrode calibration data of the meter is acceptable. If not, there may be a problem with the electrode calibration data. Check the slope of electrode again. Press **[View]**, select **Last pH Calib** and press **[Enter]**. Now, view the calibration data and slope of last calibration. If the calibration data is severely out of the expected range (the meter displays an error message, see Table 4 on page 57), this indicates a problem in the last electrode calibration, which may lead to a large measurement error. Recalibrate the electrode. Pay attention to the Buffer Group selection during calibration.

NOTE In the measurement state, the meter may display an error message simultaneously with measurement data.

Restore factory default settings

If other troubleshooting does not find the problem, you can restore the meter to the factory default settings. This clears all user calibrations and settings so that you can verify that an erroneous calibration or setting is not the cause of the problem. After restoring the factory default settings, retest the meter.

To restore factory defaults (Set Default)

Select **Set Default** from the initial state display to restore all parameters to the factory defaults settings. The factory defaults are listed below.

- Clear mV Zero:

  Any user-set mV zero value is cleared. With the short-circuit plug connected, check the mV reading. If the meter displays a non-zero mV value, adjust the mV zero. Failure to check and adjust the mV zero can lead to incorrect measurements.

- Modify Buffer Group data:

  The Buffer Group of NIST standards includes three points, 4.01 pH, 7.00 pH, and 10.01 pH. The Buffer Group of DIN standards includes five points: 1.68 pH, 4.01 pH, 6.86 pH, 9.18 pH, and 12.45 pH. The Buffer Group of GB standards includes five points: 1.68 pH, 4.01 pH, 6.86 pH, 9.18 pH, and 12.45 pH. For example, the current Buffer Group is set up as GB standards.

- Modify pH Calibration data:

  Three standard buffer solutions and the data are as listed below. By default, the electrode slope is set to 100% and E_0 is set to 0.0 mV.

  - pH buffer 1: 4.003 pH/177.299 mV/25.0 °C
  - pH buffer 2: 6.864 pH/ 8.046 mV/ 25.0 °C
  - pH buffer 3: 9.182 pH/-129.085 mV/ 25.0 °C

- Set manual temperature: 25 °C
- Set measuring method: **Continuous Mode**

- Set interval of **Timed Mode**: 10 minutes.
- Disable calibration message interval (**Calib Interval**)
- Set the meter to overwrite the oldest data with new data if the data storage becomes full.
- Set **Operator No.**: 000
- Set **Auto-Lock** condition in auto-lock reading mode: 0.1 pH
- Set **Auto-Lock Time** in auto-lock reading mode: 5 s
- Set pH resolution: 0.001 pH
- Set **Auto Power Off**: 0 (disabled)

Meter Self-Diagnostics and Messages

The meter supports self-diagnosis, which can find some common errors caused by meter, electrode, solution, or operation. It deals with these errors differently according to their severity.

There are two levels of severity: **Severe system errors** hinder further use of the meter or make the meter unable to finish necessary tasks. In this case, replacement or maintenance of the meter is required.

Minor errors, which are prompts or warnings, are caused by various reasons and can be corrected in several ways. However, you must pay attention to these errors to ensure measurement integrity and reliability. If you ignore these error messages the operation can continue.

Severe errors

When severe errors occur in the meter, the meter will shut down and display an error message similar to Figure 29. In this case, the only operation that can be performed is to turn off the meter.

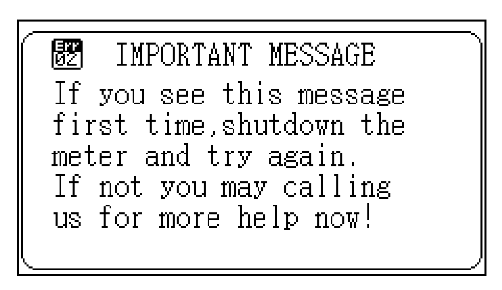


Figure 29 Severe error message

Error warning

Error warnings indicate improper electrode installation, solution problems, and electrode setup during use. Read these error warnings carefully. Proper maintenance and operation will reduce errors.

Figure 30 shows an example error warning that temperature is out of range.

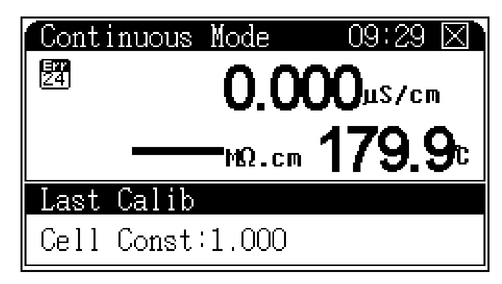


Figure 30 Temperature warning

Err 24 is the error warning icon. The icon includes the error code. See Table 4 for details.

Table 4 Error warning codes

Code	Description	Solution	Memo
00	Conductivity measuring module error	Contact Customer Service.	Serious error
01	DO measuring module error	Contact Customer Service.	Serious error
02	Temperature measuring module error	Contact Customer Service.	Serious error
03	Data storage error	Contact Customer Service.	Serious error
20	Potential is out of range	Replace electrode.	–1999.9 to 1999.9 mV
21	pH/pX is out of range	Replace electrode.	–3.000 to 21.000 pH
22	Conductivity is out of range	Replace probe and solution.	0 to 2000 mS/cm
23	Resistivity is out of range	Replace probe and solution.	0 to 100 MΩ• cm

Table 4 Error warning codes (continued)

Code	Description	Solution	Memo
24	Temperature is out of range	Replace electrode and reduce solution temperature.	–6.0 to 120.0 °C
25	DO electric current is out of range	Replace electrode.	0 to 4000 nA
26	pH electrode slope is out of range	Replace electrode and recalibrate it.	80 to 120 %
27	Failed to recognize pH buffers	Replace electrode, setup proper buffer group and replace buffers.	
28	Temperature of pH buffer is out of range	Cool or heat buffer.	
29	Calibrate the same buffer repeatedly	Replace the buffer.	Due to incorrect operation
30	Number of pH buffers exceeds maximum.	Remove one or more buffers from the group.	5 buffers at most
31	pH buffers conflict with each other	Remove one or more buffers with neighboring pH values.	
32	The data storage is full.	Cover the previous data and store new data.	Do not delete all data
33	The internal clock has a low battery.	Set time manually.	
34	Number of customer-defined ions exceeds maximum	Delete one or more unnecessary customer-defined ions.	
35	The maximum ion mode number stored	Delete all storage data of certain ion mode.	

Maintenance

This section describes how to maintain and store the electrode.

Electrode cleaning

General electrode cleaning includes inorganic cleaning, organic cleaning, grease cleaning, protein precipitation cleaning and glass sensitive membrane regeneration. The type of cleaning needed depends on the contaminants and the electrode. After one or more cleaning procedures, rinse the outside of the electrode with distilled water. Siphon the reference filling solution away and add fresh solution. Repeat 2 or 3 times. Store the PH electrode in reference filling solution for at least one hour after cleaning. Store the pH electrode in the storage solution.

Electrode storage

When the electrode will not be used for 3 hours or more, store it in reference filling solution. For refillable electrodes, plug the filling hole. When the electrode is not used for a long time, put the electrode back in the box and store it a dry place at ambient temperature.

Consumables and replacement parts

Table 5 lists the consumables and replacement parts for the 3200P pH Meter.

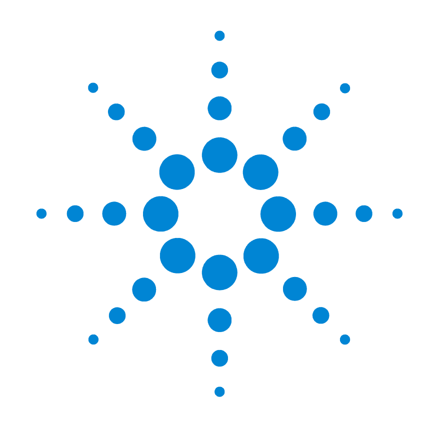
Table 5 3200P pH Meter Consumables

Order No.	Model and name	Description
G4388A	3200SA Stirrer	Electrode holder and magnetic stirrer should be combined to stir solution with stable and precise speed with a large adjustable range.
G4389A	3200EA Electrode holder	It is used to support different probes and electrodes.
G4390A	Software package	3200P pH Meter can communicate with computer after this software package is installed (including software and communication cable).
5185-8389	Power adaptor	100–240 VAC, 1 A, 50/60 Hz
G4388-27000	Stirring bar	It is used with stirrer.
5190-3988	P3211 pH Combination electrode	Combination electrode, glass body and refillable
5190-3989	P3212 pH Combination electrode	Combination electrode, plastic body and non-refillable
5190-3990	P3311 pH Triode combination electrode	Triode combination electrode, with built-in ATC probe, glass body and refillable
5190-3991	P3111 pH Electrode	Glass body, single electrode
5190-3992	P3213 pH Combination electrode	Combination electrode, plastic body, flat sensitive glass membrane, refillable
5190-3993	P3214 pH Combination electrode	Combination electrode, plastic body, spear-tip sensitive glass, and non-refillable
5190-4003	R8111 Reference electrode	Glass body, ceramic junction, Ag/AgCl and single-junction
5190-3999	ORP8211 ORP electrode	Combination electrode, glass body and refillable
5190-3998	T7111 ATC Probe	Stainless Steel Temperature measurement range: 0–100 °C
5185-8390	ATC temperature diagnostic tool	Temperature troubleshooting
5185-8391	Conductivity diagnostic tool	Conductivity troubleshooting
G4383-40000	Short circuit plug	Used for zero potential calibration and troubleshooting.

Table 5 3200P pH Meter Consumables (continued)

Order No.	Model and name	Description
5190-0533	pH Buffer Kit (NIST Standard)	4.01, 7.00, 10.01 pH; Bottled Solution, 250 mL/bottle
5190-0534	pH Buffer Kit (GB Standard)	4.00, 6.86, 9.18 pH Bottled Solution, 3 X 250 mL/bottle
5190-0538	pH 4.00 Buffer (GB Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0535	pH 4.01 Buffer (NIST Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0539	pH 6.86 Buffer (GB Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0537	pH 7.00 Buffer (NIST Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0540	pH 9.18 Buffer (GB Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0536	pH 10.01 Buffer (NIST Standard)	Bottled Solution, 3 X 250 mL/bottle
5190-0545	Reference Filling Solution	Bottled Solution, 3 X 30 mL/bottle

Visit the Agilent website at http://www.agilent.com/chem for the latest consumables and replacement parts.



Agilent 3200P pH 计

用户手册



声明

手册部件号

5973-1775

版本

第一版 , 2012 年 3 月

中国印刷

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安全声明

小心

小心提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会损坏产品或丢失重要数据。只有完全理解并符合指定的条件时，才可以忽略小心提示的要求继续进行操作。

警告

警告提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会导致人身伤害或死亡。只有完全理解并符合指定的条件时，才可以忽略警告提示的要求继续进行操作。

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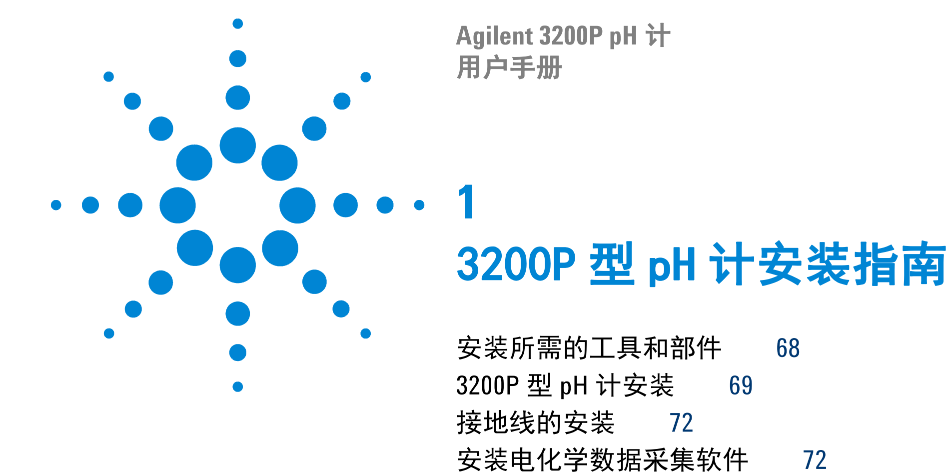
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本安装过程，要求使用随 3200P 型 pH 计附带的配件。

安装所需的工具和部件

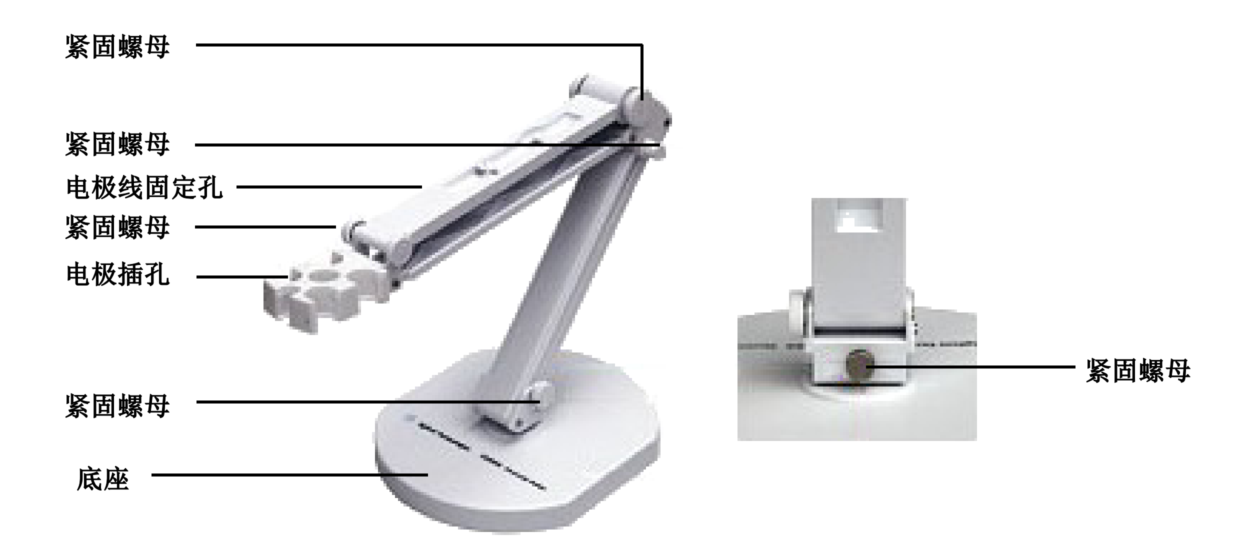
Agilent 提供所需的安装工具，在 pH 计装运包装箱中可找到以下部件：

- 电极支架 (G4389A)
- 电极 ，如 P3211 pH Combination Electrode (5190-3988)
- 电源适配器 (5185-8389)

3200P 型 pH 计安装

打开 3200P 型 pH 计包装，取出 pH 计、电极支架以及相关附件。

电极支架的安装



电极的安装

在 pH 计的背面找到 pH/pX 电极接口、温度电极接口，然后，分别将 pH 测量电极、温度电极 （5190-3998）插入相应 pH/pX 电极接口和温度电极接口内，并将电极线夹在电极支架边缘固定孔中。



电源适配器的安装

仪器随机提供电源适配器。请注意，本适配器只适用于本仪器，不建议用于其他类型的仪器。我们也不建议使用其他类型的电源适配器。

本电源适配器适用于以下电源：100~240VAC， 1A， 50/60Hz。

对应不同地区的电源，电源适配器提供多种转接插头，用户请正确选择合适的电源插头，然后按照图示将电源插头安装到适配器底座上，听到“啪”的一声表示已经安装到位。



接地线的安装

仪器随机提供接地线，但是接地线在测量过程中不是必须安装的。有时电极和被测溶液组成的测量部分会受到某些设备的干扰（如恒温槽等设备），从而引起跳字、影响测量，此时必须将测量部分屏蔽起来，并安装接地线，消除干扰。当仪器受到干扰时，将 DC501 接地线一端连接仪器，另一端连接测量部分的屏蔽层，比如恒温槽的外壳等。

安装电化学数据采集软件

本软件是为了方便用户使用而开发的一套数据采集软件（ 本软件 G4390A 需要另外购买)。如果用户需要，请选择安装。

pH 计安装好后，在计算机上安装电化学数据采集软件，采用 USB 接口连接线可实现与计算机通讯。请参阅电化学数据采集软件的安装说明。

安装数据打印软件

安捷伦为 3200P 型电导率仪提供了免费的数据打印软件。

本软件是为了方便用户使用而开发的。如果用户需要，请选择安装。

数据打印软件界面操作

1 连接仪器电源，按 "On/Off" 键打开仪器。
2 用 USB 连接线连接仪器与 PC 机。
3 在 PC 机运行数据打印软件。

获得更多信息

pH 计和电化学数据采集软件的安装现在已经完成。有关更多信息，请参阅：

1 3200P 型 pH 计操作指南，以获得和熟悉日常操作说明。

2 电极操作指南，以获得电极使用和维护说明。

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此文档提供对组成 3200P 型 pH 计的各个组件的概述。



简介

在哪里可以获得相关信息

除此文档之外， Agilent 还提供了其他相关说明产品，这些产品描述如何安装、操作和维护 3200P 型 pH 计及其故障排除。

使用 pH 计之前，请确保已阅读 3200P 型 pH 计安装指南和操作指南。使用 pH 计时最常见的安全问题有：

1 如果选用非原机配备电源适配器可能会发生不必要的安全问题。
2 必须有良好的接地。
3 防止腐蚀性气体侵入。
4 仪器的接口必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。
5 仪器可供长期稳定使用。测试完样品，所用电极应浸在蒸馏水中。
6 pH 计属于高精度测量仪器，为了避免仪器的高阻器件受到损坏，当仪器不连接 pH 电极时，应将随机提供的短路插头 (G4383-40000) 插入 pH/pX 电极接口。当仪器连接电极时，必须将短路插头放置在干燥、干净的环境，防止短路插头受潮，再次使用时影响仪器性能，甚至损坏仪器。

Agilent 客户门户网站

Agilent 建立了一个客户门户网站，可为您所拥有的产品提供相关自定义信息。通过该 Web 服务，您可以获得多种自定义服务以及与 Agilent 产品和订单直接相关的信息。该门户网站的登录地为 http://www.agilent.com/chem。

术语解释

pH 斜率：每变化 1pH 值产生电位的变化量，通常用 mV/pH 或 % 表示。

pH 的 E_0：又称 " 零电位 "，通常是指 pH 为 7 时的电位值。

pH 的一点标定：用一种 pH 缓冲溶液进行的校准。

pH 的多点标定：用两种以上 pH 缓冲溶液进行的校准。

3200P 型 pH 计的特点

3200P 型 pH 计是一台新颖、实用的实验室分析仪器，适用于实验室精确测量水溶液的 pH 值、电位值与温度值。其主要特点为：

1 支持测量 pH 值、电位值、温度值。

2 支持自动识别，支持 NIST、 DIN、 GB 等标准。

3 支持多点标定功能，最多可以标定 5 点。

4 采用点阵式液晶，显示清晰，外形美观。具有良好的人机界面，操作方便。

5 支持 GLP 规范：

a 仪器要求设置操作者编号并记录；

b 记录并允许查阅、打印标定数据。

c 支持贮存符合 GLP 规范的测量数据 200 套。

6 允许查阅、打印、删除贮存的测量数据。

7 支持三种测量模式：连续测量模式、定时测量模式和平衡测量模式，可以满足用户不同测量需要。

8 具有 USB 接口，配合专用的通信软件，可以实现与 PC 连接。

9 具有断电保护功能，仪器使用完毕关机后或非正常断电情况下，仪器内部贮存的测量数据、标定数据以及设置的参数不会丢失。

10 仪器支持自动关机功能。

11 仪器支持恢复默认数据功能；支持自诊断，可以诊断仪器是否正常工作。

12 带有背光设计，可以在阴暗的环境下使用。

13 采用新型材料 PC 面板，轻触按键设计，可靠性好，寿命长。

14 仪器具有固件升级功能，当仪器有功能性的拓展时，可以使用本功能更新。

3200P 型 pH 计的主要技术性能

3200P 型 pH 计的主要技术性能包括测量范围、分辨率、电子单元基本误差、仪器正常工作条件以及外形尺寸和重量。

1 测量范围

- pH：-2.000pH ～ 20.000pH ；
- mV：-1999.9mV ～ 1999.9mV ；
- 温度：-5.0 ～ 110.0 ℃。

2 分辨率

- pH/pX：0.1/0.01/0.001pH/pX ；
- mV：0.1mV ；
- 温度：0.1 ℃。

3 电子单元基本误差

- pH/pX：±0.002pH/pX ；
- mV：±0.03%FS ；
- 温度：±0.1 ℃。

4 仪器正常工作条件

- 环境温度：0 ～ 40 ℃；
- 相对湿度：不大于 85%；
- 供电电源：电源适配器 (5185-8389，输入：100-240VAC， 1A ；输出：9VDC， 1A) ； ；
- 周围无影响性能的振动存在；
- 周围空气中无腐蚀性的气体存在；
- 周围除地磁场外无其他影响性能的电磁场干扰。

5 外形尺寸 (长 × 宽 × 高， mm)：

- 190×190×105

6 重量 (kg)：

- 约 1kg。

使用 pH 计的方法

pH 计主要用来精密测量液体介质的 pH 值。

使用 pH 计测量溶液 pH 值时需要进行 3 个主要步骤。它们是:

1 功能设置
2 电极准备
3 pH 的测定

界面会显示 pH 计的状态信息，而且可以通过操作键盘相对应的按键更改用户的参数设置。 pH 计由电子单元和电极系统组成，电极系统包括 pH 复合电极、温度电极（实际型号一切以实际的装箱单为准。）。

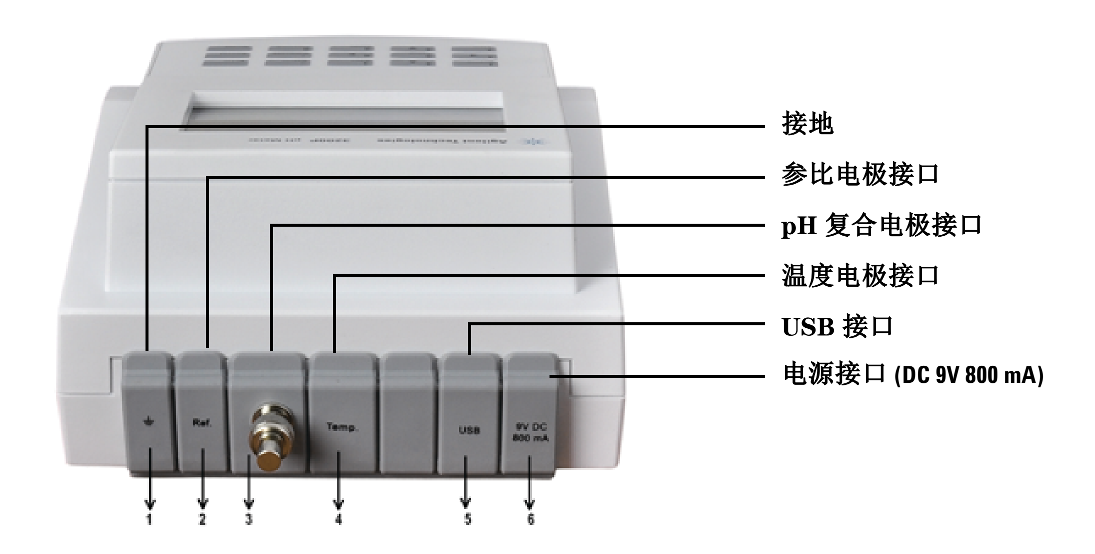
下面将描述此每个部分。



3200P 型 pH 计的前视图



3200P 型 pH 计的后视图



操作盘

操作盘由显示屏和操作键盘组成。

显示屏

显示目前正在执行的活动和工作状态。仪器正确连接电源后，按 “On/Off” 键打开仪器，仪器将显示公司名称、仪器型号、版本号等信息，并开始系统自检，完成后进入仪器的起始状态，仪器的起始状态显示如图，其中显示屏左面显示有当前的系统时间，右面为当前设置好的测量模式、测量参数以及上次标定情况。



操作键盘

3200P 型 pH 计有 15 个操作按键，分别为：1/ 输出键、 2/ ▲键、3/ 贮存键、4/◀ 键、5/ 设置键、6/▶ 键、7/ 查阅键、8/ ▼键、9/ 模式键、0/ 测量键、·/ 标定键、-/ 删除键、确认键、取消键、开 / 关键等。除确认键、取消键外，其余都为双功能键，分别介绍如下。

1/ 输出键：输入数字 “1” ；在查阅贮存数据或标定数据时输出贮存数据或标定数据；

2/ ▲键、4/◀ 键、8/ ▼键、6/▶ 键：输入数字 “2”、“4”、“8”、“6” ；方向键，用于选择菜单等；

3/ 贮存键：输入数字 “3” ；测量时贮存测量结果；

5/ 设置键：输入数字 “5” ；在不同的操作情况下设置不同的功能；

7/ 查阅键：输入数字 “7” ；查阅贮存数据或标定数据；

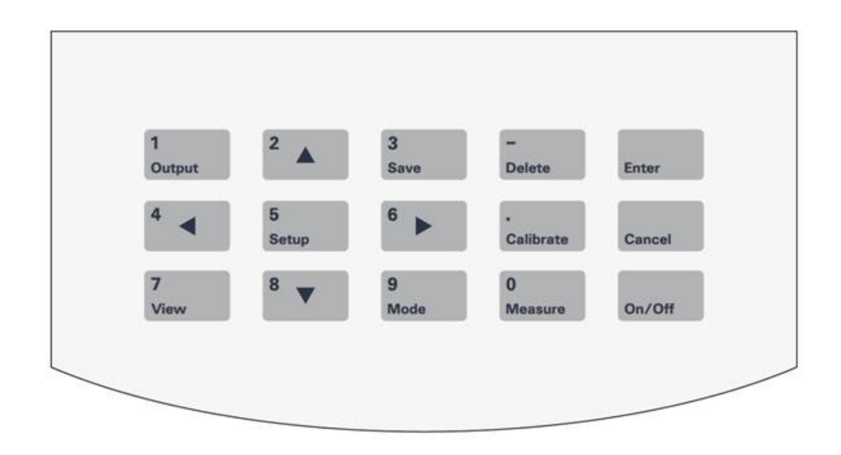
9/ 模式键：输入数字 “9” ；测量状态下用于切换显示窗口或参数；

0/ 测量键：输入数字 “0” ；在仪器的起始状态开始测量；

·/ 标定键：输入小数；标定电极；

-/ 删除键：输入负数；清除全部输入；在查阅贮存数据时可以删除贮存的数据。

开 / 关键：打开或者关闭仪器。



操作基本知识

本节描述使用 3200P 型 pH 计可以执行的任务。

概述

操作 pH 计涉及下列任务：

- 启动 3200P 型 pH 计。启动 3200P 型 pH 计。
- 功能设置。请参阅 " 起始状态下的功能设置 "。
- 电极准备。请参阅 " 电极准备 "。
- 零点电位的校正。请参阅 " 零点电位的校正 "。
- pH 标液组的选择。请参阅 " 设置标液组 "。
- pH 电极的准备。请参阅 " 电极的准备 "。
- pH 电极的标定。请参阅 " 电极的标定 "。
- pH 值的测量。请参阅 "pH 值的测量方法 "
- 电位测量。请参阅 " 电位的测量方法 "。
- 温度的测量。请参阅 " 温度的测量方法 "
- 数据贮存功能。请参阅 " 数据贮存功能 "。
- 数据删除功能。请参阅 " 数据删除功能 "。
- 数据输出功能。请参阅 " 数据输出功能 "。
- 查阅贮存数据。请参阅 " 查阅功能 "。
- 查阅上次标定数据。请参阅 " 查阅功能 "
- 关闭 3200P 型 pH 计。请参阅 " 关闭 3200P 型 pH 计 "。

仪器控制

3200P 型 pH 计通常直接由操作按键控制。此外，3200P 型 pH 计可以通过电化学数据采集软件与计算机通讯。

启动 3200P 型 pH 计

首先要正确地安装和维护 pH 计。开机前，须检查电源是否接妥，应保证仪器良好接地。电极的连接须可靠，防止腐蚀性气体侵袭。仪器插入电源后，按 "On/Off" 键开机。

起始状态下的功能设置

仪器的起始状态显示如图 1，其中显示屏左面显示当前的系统时间；右面为当前设置好的测量模式、测量参数为 pH 值、以及前一次的标定数据。

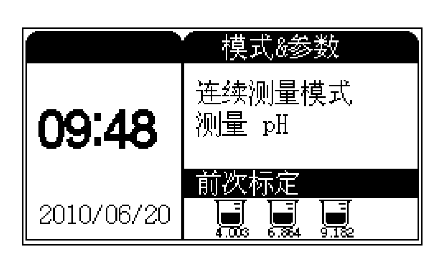


图 1

在起始状态，按“ 设置 ” 键可以设置 “ 设置测量模式 ”、“ 系统设置 ”、“ 设置语言 ”、“ 设置手动温度 ”、“ 设置平衡条件 ” 、“ 设置自动关机 ”、“ 恢复默认设置 ” 等。按 “ 设置 ” 键，仪器显示设置菜单，显示如图 2。

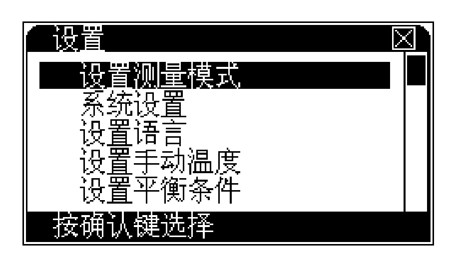


图 2

仪器突出显示当前的菜单项，用户可以按方向键选择合适的菜单项，按 “ 确认 ” 键选择相应的功能模块；按 “ 取消 ” 键退出功能菜单选择。“ 设置测量模式 ”：设置当前的测量模式（连续测量模式、定时测量模式、平衡测量模式）以及需要测量的测量参数； “ 设置手动温度 ”：如果仪器不接温度电极，可以使用手动温度值； “ 设置平衡条件 ”：设置平衡测量模式下的各测量参数的平衡条件； “ 系统设置 ”：设置系统时间、 GLP 选项； “ 设置语言 ”：本仪器支持中、英文版本； “ 设置自动关机 ”：仪器具有自动关机功能，用户可以设置自动关机时间； “ 恢复默认设置 ” 允许用户恢复测量参数至默认值，方便仪器自诊断。

设置测量模式　仪器支持三种测量模式，包括连续测量模式、定时测量模式、平衡测量模式。

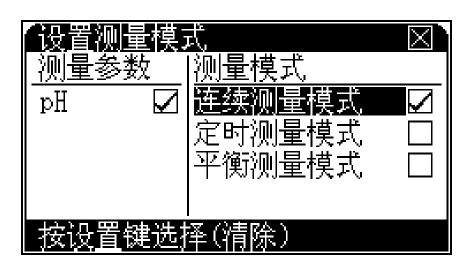


图 3

用户选择了相应的参数以及测量模式后，下次测量时即可按照当前设置情况进行测量。 在实际测量中，虽然用户选择了某个测量参数，仪器仍然允许用户随时查看其他参数值。

按 " 设置 " 键，再按 " 确认 " 键后，即可设置测量模式，显示如图 3，其中左面为测量参数列表，即测量 pH 值；右面为测量模式列表，包括连续测量模式、定时测量模式、平衡测量模式；显示 "√" 的表示为当前选中的测量参数或者测量模式；突出显示的表示当前光标位置；按方向键移动光标位置；移动到合适的项目后，按 " 设置 " 键选择（或清除）当前项目。按 " 确认 " 键，仪器自动保存当前的所有设置，返回起始状态；按 " 取消 " 键仪器放弃当前设置返回起始状态。图 4 即为选择测量参数后实际测量显示图。

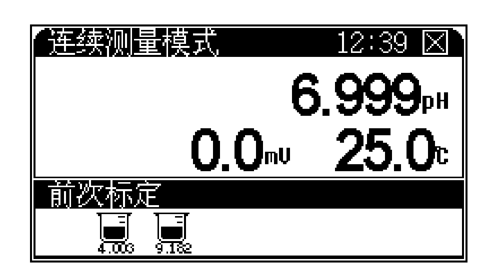


图 4

为了方便用户随时查看其它参数值，仪器设置了一个特别的查看功能。在测量状态下，按 " 模式 " 键，仪器即突出显示测量窗口，如图 5，重复按 "4/◀" 或 "6/▶" 键，可以查看其他测量参数，比如，当前测量参数为 pH 值，则重复按 "4/◀" 或 "6/▶" 键时，仪器会在

pH 值、电位值之间来回切换。查看结束，如果用户在几秒钟里面没有继续按键，仪器会自动退出查看状态。这个功能有利于多个参数的切换。

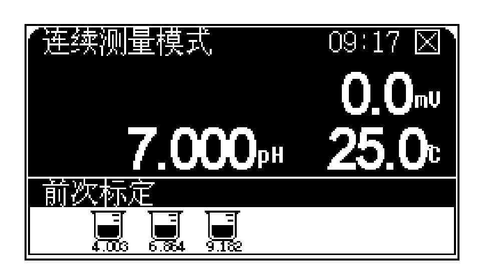


图 5

- **连续测量模式**

  这是最常使用的一种测量模式，开始测量后，仪器始终连续测量、计算和显示测量结果，用户在测量期间可以查阅测量参数、标定电极、贮存或打印测量结果等等，测量结束，用户按 " 取消 " 键并 " 确认 " 后退出测量模式。

- **定时测量模式**

  定时测量模式是为了方便用户检测而设置的，比如需要连续 30 分钟检测 pH 值，则用户可以选择这种定时测量模式，开始测量后，仪器会自动测量、计算和显示测量结果，到用户设定的时间间隔时，仪器自动贮存测量数据，然后开始下一次的测量。按 " 取消 " 键并 " 确认 " 后可以退出定时测量模式。

  如果用户选择定时测量模式，需要设置定时间隔，时间间隔 1~99 分钟，默认间隔为 10 分钟。

- **平衡测量模式**

  用户首先应该设置好平衡条件 （详见 " 设置平衡条件 "），开始测量后，仪器自动测量、计算并显示测量结果，一旦测量符合设定好的平衡条件，本次测量即结束。

  在测量过程中，用户可以查阅测量参数、标定电极等。测量结束后，用户可以贮存、打印测量结果；按 " 取消 " 键退出测量状态，或者选择按 " 测量 " 键开始下一次测量。

设置手动温度　如果连接有温度电极，仪器自动采用温度电极的温度值，反之，仪器采用用户设定的手动温度值。按 “ 设置 ” 键，选择 “ 设置手动温度 ” 项，按 “ 确认 ” 键，仪器即进入手动温度设置模块。如图 6 按 “ 设置 ” 键修改手动温度值。用户按照实际需要，输入手动温度值即可。

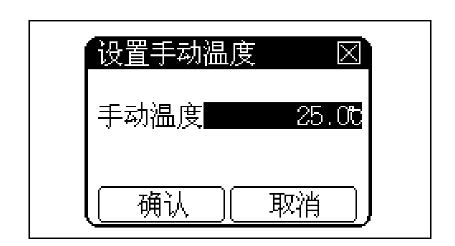


图 6

设置平衡条件　平衡测量条件对应仪器的平衡测量模式，设置各测量参数的平衡条件，图 7 显示 pH 值的平衡条件为 0.010pH，平衡时间为 5s，则表示在 5s 时间内，pH 值的变化量都小于 0.010pH 时即认为本次测量有效。

图 7

当用户选择平衡测量模式进行测量时，如果仪器在设定的平衡时间里面所有测量都符合平衡条件，则本次测量结束。平衡时间只对平衡测量模式有效，以秒 (s) 为单位，范围 1 ～ 200 秒。

系统设置　系统设置包括 GLP 规范设置、电极标定提示间隔、系统时间等。按 “ 设置 ” 键，选择 “ 系统设置 ” 项，按 “ 确认 ” 键，仪器即进入系统设置模，如图 8 所示 ,。

按方向键移至相应项后按 “ 设置 ” 键即可修改相应参数值。修改完毕，按 “ 取消 ” 键退出设置状态，返回起始状态。

“电极标定间隔”是指仪器定期提示用户标定电极，仪器会自动计算前一次标定至今的时间，如果前一次标定时间已经超过用户设定的标定时间间隔，仪器即弹出提示窗口，提示用户注意重新标定电极，电极标定间隔以小时 (h) 为单位（设置为 0 小时，则将关闭提示）。

操作者编号是一个三位数的编号，编号范围为 000 ～ 200。

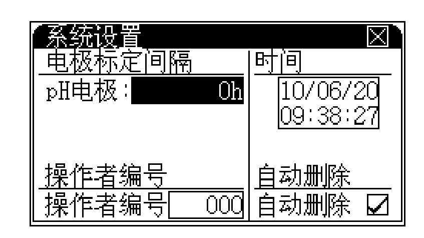


图 8

小心

自动删除贮存数据功能是指当贮存数据量达到仪器的最大贮存量时是否允许自动覆盖，重复贮存。比如，仪器允许贮存测量数据 200 套，当贮存第 201 套数据时，如果自动删除贮存数据功能打开则仪器自动将第 201 套数据存入第一个数据的位置，如果自动删除贮存数据功能没有打开，则仪器会提示 用户：从头开始贮存还是放弃当前的测量数据。

“设置系统时间”，移动至时间项，按“设置”键即可设置时间。显示如图 9，窗口显示当前时间，包括“ 年 ”、“ 月 ”、“ 日 ”、“ 时 ”、“ 分 ”、“ 秒 ”。

如果用户需要修改时间，按方向键移动光标至需要修改的时间项，按“ 设置 ”键，并输入相应时间值。

例如用户需要设置当前的月份时，可按如下方法操作：按方向键移动光标至“ 月 ”项，按“ 设置 ”键，仪器弹出输入窗口，用户按照当前月份输入，输入完毕按“ 确认 ”键退出输入窗口。同理，可修改其他时间项，等所有的时间项修改完毕，按“ 确认 ”键即完成最后的设置，按“ 取消 ”键退出系统时间设置模块。

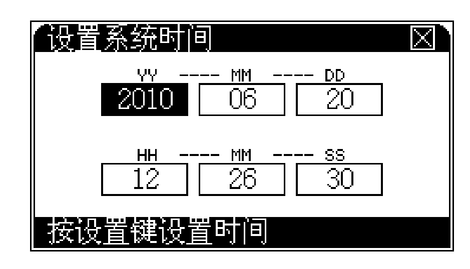


图 9

语言设置　本仪器支持中英文版本，用户可以选择使用。在起始状态下，按 " 设置 " 键选择 " 语言设置 " 后确认，用户即可选择中文或者英文版本。

设置自动关机　本仪器支持自动关机功能，允许用户设置关机时间。自动关机时间范围为 10~480min，当仪器运行到设定的自动关机时间时，仪器将强制关机。设置零值，可以关闭自动关机功能。当仪器连接电化学数据采集软件时，此功能无效。

恢复默认设置　由于某些操作或者使用上的原因，可能会导致测量参数改变，利用此功能可以恢复至默认值。执行此功能后的具体参数如下：

- 清除零点电位 :

  此功能可防止由于用户误操作等原因影响仪器的准确测量。此时连接短路插头后，仪器电位值可能不显示零值，需要重新校正零点电位。

- 修改标液组设置：

  将 NIST 标液组的标液设置为 3 点：4.01pH、 7.00pH、 10.01pH ； DIN 标液组的标液设置为 5 点：1.68pH、 4.01pH、 6.86pH、 9.18pH、 12.45pH ； GB 标液组的标液设置为 5 点：1.68pH、 4.01pH、 6.86pH、 9.18pH、 12.45pH ；选择 GB 作为当前的标液组。

- 修改 pH 的标定数据：

  标液数为 3 个；　具体标液数据如下，此时默认电极斜率为 100%，零点为 0.0mV。

  标液 1:　4.003pH/177.299mV/25.0 ℃ ,

  标液 2:　6.864pH/ 8.046mV/ 25.0 ℃ ,

标液 3:　9.182pH/-129.085mV/ 25.0 ℃。

- 设置手动温度为 25.0 ℃；
  - 设置测量模式为连续测量模式；
  - 设置定时测量模式的定时间隔为 10min ；
  - 关闭标定间隔提示功能；
  - 允许数据从头覆盖；
  - 设置操作者编号为 000 ；
  - 设置平衡测量模式下的平衡条件为 0.1pH ；
  - 设置平衡测量模式下的平衡时间为 5s ；
  - 设置 pH 显示分辨率为 0.001pH ；
  - 设置自动关机时间为 0，即关闭自动关机功能。

电极准备

1 电极应该在参比填充液 （5190-0545）中保持润湿。使用前检查电极外观上是否有机械损坏。如果储存瓶中没有保存液，在使用之前将电极放在参比填充液中浸泡至少两小时。

2 将测试探头从保护套或储存瓶中拿出来， 保存保护套或储存瓶以备后用。

3 如果有电解质固体在测试探头外面，用蒸馏水或者去离子水清洗干净。

4 对可充式电极，打开加液塞， 加相应的填充溶液。为了保证填充液流动，在使用时加液塞须打开，填充液面必须高于样品液面和液接界至少 20mm。液接界面必须完全浸泡在溶液中。

5 电极测量端向下，空用电极数次，以去除电极中的气泡。

6 将电极连接到仪器。将电极测量端朝下侵入到被测溶液中。

pH 值测量前的准备

测量前，用户需要进行以下一些操作步骤，才能更好地使用仪器，完成准确测量。这些步骤包括：零点电位校正；设置合适的标液组，并选用合适的标准缓冲溶液来标定电极；开始测量。

校正零点电位　尽管仪器在设计中考虑到了诸多影响测量的因素，比如环境温度的影响，但是仍然无法保证仪器能达到零漂移的理想状态。为了保证仪器的高精度测量，建议用户在测量前进行电位零点校正。

仪器连接短路插头（G4383-40000，在测量或者标定状态下，电位显示值偏离零点电位较大时，需要校正零点电位。按“设置”键，选择“校正零点电位”后，按“确认”键，仪器提示“校正当前零点电位吗？”字样，要求用户确认。按“确认”键即可校正电位零点，反之按“取消”键将放弃操作，返回测量状态。

小心 **校正零点电位时必须连接短路插头。如果仪器测量值明显偏移目标数据，首先应该连接短路插头，检查仪器零点是否正常，避免因操作不当造成零点校正错误。**

设置标液组 为了方便用户使用，仪器支持自动识别功能，能够识别多种标液组，包括 NIST 标准、 DIN 标准、 GB 标准。每种标液组支持多种标准缓冲溶液，共计 24 种标准缓冲溶液。其中 NIST 标液组包含标液 1.677pH、4.008pH、6.864pH、7.00pH、7.416pH、10.014pH、 12.469pH 等标液； DIN 标液组包含 1.680pH、3.557pH、 3.775pH、 4.008pH、 6.865pH、 7.000pH、 7.416pH、9.184pH、10.014pH、12.454pH等标液；GB标液组包含1.680pH、3.559pH、4.003pH、6.864pH、7.409pH、9.182pH、12.460pH 等标液。每个标液组最多允许选择 5 种标液。由于每个标液组里多种标准缓冲溶液之间的 pH 范围相互可能有重叠，为了保证测量精度，仪器将限制相邻标液的选择。

在查阅 pH 测量参数下，按“设置”键进入设置当前标液组模块，显示如图，图中表示当前的标液组为 DIN 标准。系统共提供 3 种标液组，分别为 NIST、 DIN、 GB 标准。图 10 中，上方显示有 3 种标液组，下方对应标液组的具体标液。用户可按方向键移动光标条来查看标液，按“确认”键选择标液组并退出设置标液组模块，返回查阅标定数据模块。



图 10

如果用户需要修改某个标液组里面的具体标液，移动光标至相应标液组，按 “ 设置 ” 键即可设置，显示如图 11，图示为 NIST 标液组选择标液的示意图，其中窗口中每个图标对应每种标准缓冲溶液，打勾的图标表示此标液已被选择、没有打勾的图标表示未被选择；突出显示的图标表示当前的标液是可操作的，此时按一次 “ 设置 ” 键即可选择或清除当前标液，图标下显示当前标液的标称 pH 值；窗口下面同时会显示相应标液的 pH 范围。用户按方向键移动光标至需要的标液，然后按 “ 设置 ” 键选择或者清除选择。

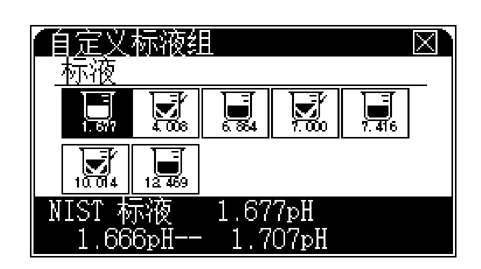


图 11

比如用户需要选择 4.008pH 标液，则移动光标至对应 4.008pH 标液的图标位置，按 “ 设置 ” 键，显示 4.008pH 的图标立即打勾显示，表示已被选择。

为避免标液间 pH 值重叠而影响标定，用户应选择实际使用的对应标液，对于其他用户不用的标液，应全部清除选择。

对应每个标液组，仪器最多允许选择 5 种标液。

pH 电极的标定

1 每次测量之前，建议用户对电极进行重新标定，标定后，前一次的标定数据将会被覆盖。
2 电极使用一段时间后，也应该重新标定。
3 设置电极标定时间间隔，仪器可以自动提示。

仪器的 pH 标定，显示如图 12，其中屏幕上半区为当前的测量数据，仪器显示当前的 pH 值 (斜率设定为 100.00%)、电位值和温度值；屏幕下面为当前的标定结果。

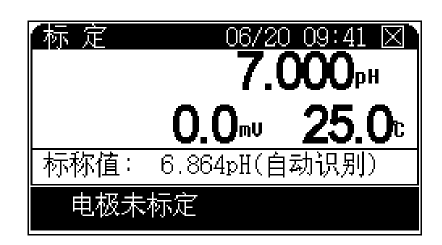


图 12

自动识别（或手动识别）表示当前仪器的识别方式，按“设置”键可选择识别方式、或者设置当前标液组；当电极放入标液显示稳定后，按确认键即可标定当前标液；按“取消”键退出标定，如图 13 所示。

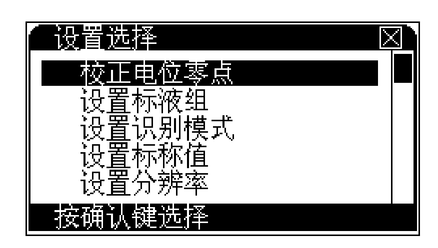


图 13

仪器可以自动识别多种标准缓冲溶液。由于多种标准缓冲溶液的 pH 范围可能相互有重叠，为了保证测量精度，开始标定前，用户应检查一下设置好的标液组。比如，如果用户用 4.003pH、9.182pH 两种标准缓冲溶液标定电极斜率，那么当前标液组必须设置为 4.003pH 和 9.182pH 二种标准缓冲溶液，否则仪器不会自动识别此二种标准缓冲溶液，从而影响标定结果甚至出现标定错误信息。在标定状态下，按“设置”键选择设置标液组（具体设置参见**设置标液组**部分），标定步骤如下：

1 开始标定前，用户准备 1 至 5 个标准缓冲溶液（可以是常规的标准缓冲溶液，也可以是用户自己的标准缓冲溶液），置于恒温下放置一定时间；

2 按照前面介绍的**设置标液组**，如果是非常规的标准缓冲溶液，请选择手动识别方式；

3 将 pH 测量电极、参比电极、温度电极等清洗干净后一起放入待标定的标准缓冲溶液中；

4 等显示稳定后，按“确认”键，仪器显示“ 存贮数据……”并存贮标定数据；

5 稍后，仪器提示用户“ 继续标定吗？ ”，如果用户有其他的标准缓冲溶液需要标定，则可选择继续标定，然后重复前面的步骤标定其他标准溶液，直至标定结束！在标定过程中，用户随时可按“ 取消 ”键结束标定。

本仪器支持最多 5 点标定，当标定至第 5 个标液并确认后，仪器会自动提示用户结束标定。

对于pH范围相互有重叠的标准缓冲溶液，比如6.864pH和7.000pH两种标准缓冲溶液，建议采用如下方法标定：

第一种　当用户标定 6.864pH 标准缓冲溶液时，请将标液组设置为只有 6.864pH 标准缓冲溶液，然后标定，等 6.864pH 标液标定完后，重新设置标液组，将标液组设置为只有 7.000pH，然后标定即可。

第二种　采用手动识别方式标定，即每次标定标准缓冲溶液时，手动输入当前标液对应当前温度下的标称 pH 值，也可完成标定，但是此方法比较烦琐。

对常规的标准缓冲溶液，用户可使用自动识别功能，配合前面设置的标液组，仪器将自动识别这些标准缓冲溶液，用户不必改变识别方式即可标定（如果无法识别，仪器会提示用户：标定错误，要求用户或更换电极、或重新设置标液组、或将自动识别方式改为手动识别，用户可按实际情况选择操作）。

当用户使用自己的标准缓冲溶液（非常规标准缓冲溶液）来标定电极时，必须使用手动识别方式。

比如，用户有一个标准缓冲溶液，已知 25.0 ℃时的标称 pH 值为 2.704pH，25.1 ℃时的标称 pH 值为 2.710pH，25.2 ℃时的标称 pH 值为 2.720pH，则用户应尽量将标定时的温度恒定在 25 ℃。开始标定后，首先将识别方式设置为“ 手动识别 ”，等显示稳定后，按“ 确认 ”键，仪器要求用户输入当前温度下的标称 pH 值，如果当前温度为 25.2 ℃，则输入 2.720，输入完毕按“ 确认 ”键，仪器贮存当前的标定数据，其它标液点的标定以此类推。

如果用户既有常规标准缓冲溶液，又有自己的标准缓冲溶液，则只需分别按自动识别方式和手动识别方式操作即可。

pH 值的测量方法　在测量 pH 前建议先进行电极的标定。测量开始后，先校正电位零点。校正完毕即可开始并测量。具体标定和校正零点电位请参阅 “pH 电极的标定 ”、“ 校正零点电位 ” 等章节。在仪器的起始状态下，按 “ 设置 ” 键选择需要的测量模式，完成后按 “ 测量 ” 键即可进入相应测量状态，显示如图 14。其中显示屏上方显示有当前的测量模式、系统时间；测量主窗口显示当前的 pH 值以及对应的电位值和温度值。

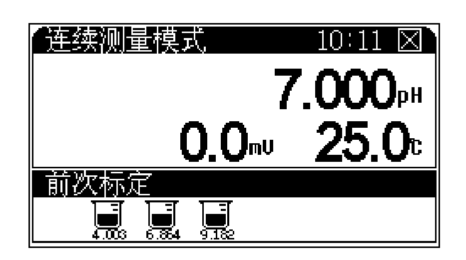


图 14

在测量过程中，用户可以重新标定电极、设置测量参数等；测量结束后，用户可以按 “ 贮存 ” 键，存贮测量数据；按 “ 输出 ” 键输出测量数据；按 “ 取消 ” 键结束测量。

小心

对应不同的测量模式，连续测量模式、定时测量模式和平衡测量模式其测量和控制过程会有很大不同，用户应根据需要选择合适的测量模式。

电位的测量方法　在任意测量状态下，仪器将始终显示当前的 pH 值和电位值。具体操作参见 pH 的测量章节。

温度的测量方法　在任意测量状态下，连有温度电极时，仪器将直接显示当前溶液的温度值。具体操作参见 pH 值的测量章节。

数据贮存功能

本仪器支持贮存 200 套 pH 值测量数据，超过 200 套时允许从头开始存贮。在不同的测量模式下，数据贮存方式有所不同，在连续测量模式和平衡测量模式，用户需等待测量结果稳定后按 “ 贮存 ” 键

来手动存贮测量数据；在定时测量模式时，仪器按照设定的定时间隔，自动定时贮存测量结果，当然用户也可以手动贮存结果。具体的测量操作方法参见前面相关章节。

数据删除功能

仪器支持贮存测量数据，也支持删除测量数据功能。对于某些因操作不当、或其他原因造成的不确定测量结果，用户可以逐个删除或者全部删除。仪器只有在查阅存贮数据状态下才能完成操作。具体操作方法如下：通常在仪器的起始状态下或者测量状态下，按 " 查阅 " 键选择查阅相应存贮数据，进入查阅贮存数据后，按 " 删除 " 键，选择相应操作即可。

数据输出功能

如果用户需要输出当前的测量数据、上次标定数据或者已存贮的数据，有两种方法可以实现。一种是用数据采集软件连接仪器，实现上述功能。

另一种是使用本公司提供的数据打印软件。用 USB 连接线连接仪器与 PC 机，然后在 PC 机上运行本软件，当用户在测量、查阅标定数据、查阅存贮数据时按 " 输出 " 键，本软件将自动接收仪器发送的相应数据，用户选择打印即可，详细参见软件操作指南。

数据查阅功能

3200P 型 pH 计允许用户查阅上次的标定数据以及查阅存贮数据。在仪器的起始状态或者测量状态下，按 " 查阅 " 键，并选择相应选项即可查阅上次标定数据和查阅存贮数据 （如图 15）。

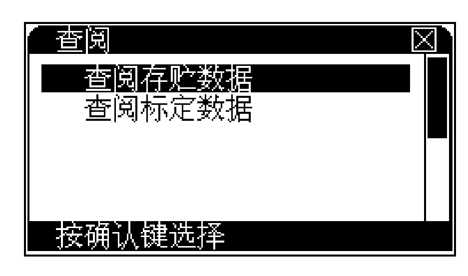


图 15

查阅存贮的数据 仪器按照测量参数存贮数据，所有存贮数据支持 GLP 规范。

在仪器的起始状态，按 “ 查阅 ” 键，选择 “ 查阅 pH 存贮数据 ” 则显示如图 16，其中显示屏上方显示当前查阅模式以及实际的存贮数；每页最多可显示 10 个存贮数据，显示情况随不同查阅模式而不同，主要包括存贮时间、操作者编号等。

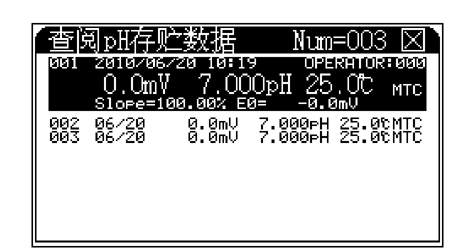


图 16

用户按方向键查看每个存贮数据。此时，如果用户需要删除存贮数据，按 “ 删除 ” 键选择相应操作。如果需要打印输出存贮数据，按 “ 输出 ” 键 （首先通过 USB 连接线连接 PC，具体设置参阅打印输出功能）选择相应操作，其输出格式大概如下：

```
========================
MODEL
                   3200P
               pH METER
VERSION
                VER 1.00
PRINT TIME
                10:25:42
              2010/06/20
OPERATOR NO
                     000
************************
STORED NUM:          003
************************
                  NO:001
OPERATOR NO:         000
STORED TIME:    10:19:00
              2010/06/20
SLOPE:           100.00%
E0:               -0.0mV

POTENTIAL:         0.0mV
```

```
pH:                7.000pH
TEMP:                25.0c
TC.TYPE:               MTC
************************
                    NO:002
OPERATOR NO:           000
STORED TIME:      10:19:00
                2010/06/20
SLOPE:             100.00%
E0:                 -0.0mV

POTENTIAL:           0.0mV
pH:                7.000pH
TEMP:                25.0c
TC.TYPE:               MTC
************************
                    NO:003
OPERATOR NO:           000
STORED TIME:      10:19:00
                2010/06/20
SLOPE:             100.00%
E0:                 -0.0mV

POTENTIAL:           0.0mV
pH:                7.000pH
TEMP:                25.0c
TC.TYPE:               MTC
========================
```

查阅上次标定数据

在仪器的起始状态下，按 " 查阅 " 键，选择 " 查阅 pH 标定数据 " 后，按 " 确认 " 键即可查阅 pH 的上次标定数据，显示如图 17，其中显示屏上方为上次的标定数据；下面为当前的标液组情况，用户可按 " ▲ "、 " ▼ " 键查看详细的标定信息。

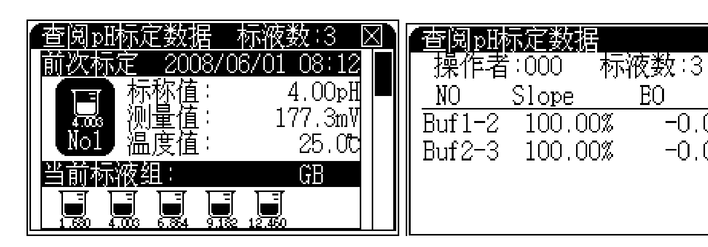


图 17

如果用户需要打印当前的参数数据，可通过 USB 连接线连接 PC，按 “ 输出 ” 键即可打印标定数据，具体设置请参阅打印输出功能。打印输出格式大概如下：

```
========================
MODEL
                   3200P
               pH METER
VERSION
                VER 1.00
PRINT TIME
                10:11:27
              2010/06/20
OPERATOR NO
                     000
************************
PH CALIB DATA
CALIB TIME:     08:12:00
              2008/06/01
OPERATOR NO:         000

                 POINT 1
pH:             4.003pH
POTENTIAL:      177.3mV
TEMP:             25.0c
************************
                 POINT 2
pH:             6.864pH
POTENTIAL:        8.0mV
TEMP:             25.0c
************************
                 POINT 3
pH:             9.182pH
POTENTIAL:     -129.1mV
```

```
TEMP:              25.0c
************************
CALIB RESULT
SLOPE 1:         100.00%
E0 1:             -0.0mV
SLOPE 2:         100.00%
E0 2:             -0.0mV
========================
```

关闭 3200P 型 pH 计

用户使用完毕，如果需要存贮数据请确保已按 " 贮存 " 键，此时按仪器的 " 开 / 关 " 键关闭仪器。测试完样品，所用电极应浸在蒸馏水中。如果仪器长期不用，请注意：

1 断开电源适配器的电源，以免损坏电源适配器并间接损坏仪器，给您带来不必要的损失！
2 仪器的插座必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。
3 仪器不使用时，短路插头也要接上，以免仪器输入开路而损坏仪器。
4 测量结束，建议将电极存放在参比填充液中。对可充电极，将加液塞塞上。长期不使用时，将电极放回盒体内室温保存。

更正问题

1 接通电源后，若显示屏不亮，应检查电源器是否有电压输出。
2 仪器不使用时，短路插头也要接上，以免仪器输入开路而损坏仪器。
3 仪器必须有良好的接地，防止腐蚀性气体侵入。
4 若上述各种情况排除后，仪器仍不能正常工作，则与有关部门联系。

软件通讯操作

本节描述 3200P 型 pH 计通讯软件的安装和操作。

安装软件

安捷伦为 3200P 型 pH 计与计算机通讯提供了电化学数据采集软件。

本软件是为了方便用户使用而开发的一套数据采集软件 (本软件 G4390A 需要另外购买)。如果用户需要，请选择安装。

按照数据采集软件说明来安装，安装完毕后，可以从桌面图标或 " 开始 " 菜单打开软件。

软件通讯界面操作

1 连接仪器电源，按 "On/Off" 键打开仪器。
2 用 USB 连接线连接仪器与 PC 机。
3 在 PC 机运行电化学数据采集软件，软件将自动识别连接的仪器型号、类型，并自动配置相应的功能；详细参见电化学数据采集软件使用说明书。

数据打印软件操作

安装软件

安捷伦为 3200P 型 pH 计与计算机提供了免费的数据打印软件。

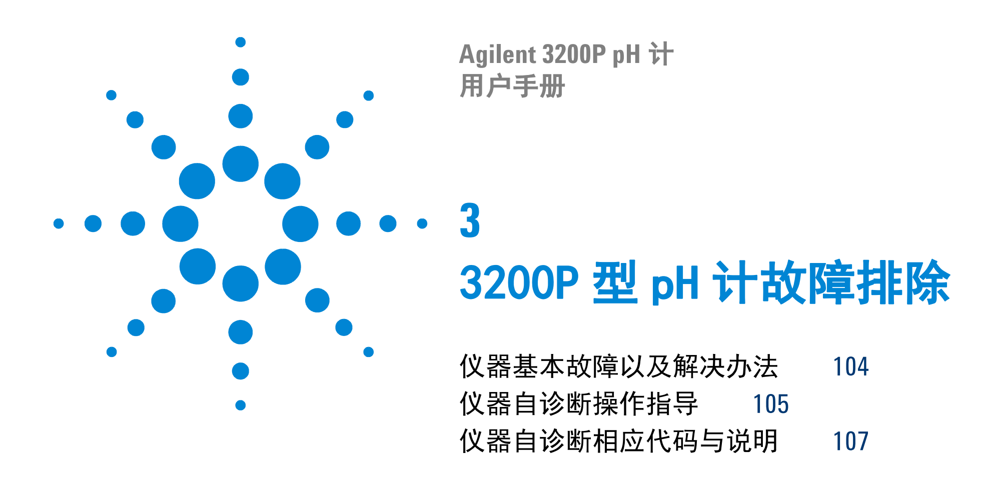
本软件是为了方便用户使用而开发的数据打印软件。如果用户有需要，请选择安装。

数据打印软件界面操作

1 连接仪器电源，按 “On/Off” 键打开仪器。

2 连接仪器与 PC 机。

3 在 PC 机运行数据打印软件，软件将自动识别连接的仪器型号、类型。当仪器处于测量状态、查阅上次标定数据或者查阅存贮数据时，用户按 “ 输出 ” 键，软件将接收仪器发送的数据，用户选择打印即可，详细参见数据打印软件使用说明



3
3200P 型 pH 计故障排除

仪器基本故障以及解决办法 104
仪器自诊断操作指导 105
仪器自诊断相应代码与说明 107

此文档提供仪器基本故障解决方法，在使用过程中，仪器出现故障，可根据本文件排除基本故障。

仪器基本故障以及解决办法

编号	故障项目	故障原因	解决办法
1	仪器开机不显示	**1** 电源适配器安装有问题 **2** 使用的电源与要求的不一致 **3** 电源适配器损坏 **4** 电源插座接触不良 **5** 可能液晶损坏 （开机一段时间后，按 “On/Off” 键能听到蜂鸣声，但液晶始终无显示）	**1** 按说明书重新安装 **2** 请使用仪器要求的电源 **3** 更换电源适配器 **4** 保证接触良好 **5** 联系代理商
2	按键无蜂鸣声	**1** 按下了无效的按键。 **2** 蜂鸣器损坏	**1** 选择有效的按键操作 **2** 联系代理商
3	按键无响应	**1** 按下了无效的按键 **2** 按键损坏	**1** 选择有效的按键操作 **2** 联系代理商
4	仪器不连接温度电极时不显示 25.0 ℃	仪器不连接温度电极时，仪器自动使用设置的手动温度值。	设置手动温度至 25.0 ℃。
5	测量时跳字严重，甚至无法正常测量	**1** 电极已损坏，或过保质期 **2** 周围有强干扰的信号存在	**1** 更换电极 **2** 隔开测量溶液与干扰源的联系，比如抬高测量溶液的烧杯；用仪器随机提供的接地线连接，一头连接仪器，一头连接干扰源的外壳。

仪器自诊断操作指导

在使用过程中，有很多因素会影响测量结果，包括测量使用的电极、标定电极斜率的标准缓冲溶液、样品溶液、测量时的温度、操作或者使用不当等等，当出现测量结果与预想的结果值相差甚远时，为了更好地快速判断是仪器本身还是仪器以外的因素导致测量的误差，可以参照本操作指导进行简单的自我诊断。

仪器的电位诊断

断开测量电极，仪器连接随机提供的短路插头；开机，进入测量状态，此时仪器显示的电位值应该 -0.5~0.5mV (通常叫零电位)，表示仪器硬件功能正常；如果零电位偏差较大，请使用校正零点电位功能，校正后电位值应显示为零值 (具体校正方法参见前面章节) ；如果零点电位确实偏移很大，仪器无法完成校正，则说明硬件有问题，请联系相关部门。

仪器的 pH 值诊断

断开温度电极；仪器将使用设置的手动温度值，将手动温度设置为 25.0 ℃ （具体参见设置手动温度章节）；电位为零时，仪器显示的 pH 值应该在 6.99~7.01pH，则表明仪器的电极标定数据满足测量要求，否则有可能是电极标定数据不正确造成，需要进一步查看电极斜率。按 " 查阅 " 键选择 " 查阅标定数据 " 项并确认后，可查看前一次的标定情况以及电极斜率值。如果标定的数据严重超出测量要求 (仪器显示有错误标记，错误代码参见后面的表格)，则表示前一次的电极标定有问题，可能导致较大测量误差，需要重新标定，标定时请注意标液组的选择。注意，在测量状态下，仪器也会有同步的错误提示。

仪器的温度诊断

仪器连接随机提供的 ATC 温度诊断工具（5185-8390），开机，进入测量状态，此时仪器显示的温度值在 49.0~51.0 ℃，则表示仪器的温度测量正常。如果偏差很大，则表示仪器硬件有问题，请联系相关部门。

仪器的恢复默认值诊断

为了彻底验证仪器，可以使用恢复默认设置功能，将电极斜率恢复到默认值 100%，电极零点为 0.0mV，手动温度为 25.0 ℃的理想状态。注意，使用本功能后，仪器在恢复电极标定数据的同时，还将恢复其他的默认设置，请用户注意。退出测量状态，在仪器的起始状态下，按“设置”键选择“恢复默认设置”项并确认，即可恢复默认值。然后按照上述步骤再次验证仪器是否存在问题。

按照上述方法可简单判断是仪器本身硬件、电极标定数据，还是电极以外的测量因素导致测量误差。对应仪器以外的原因，用户可以使用类比的办法，将电极放置在不同的标准缓冲溶液中，查看测量的电位或 pH 值，类比判断是电极本身，还是溶液问题，抑或是其他原因。

仪器自诊断相应代码与说明

本仪器支持自诊断功能，能描述常规的由于仪器本身、电极本身、溶液本身、或者操作本身而导致的一些错误。针对错误的严重程度，仪器予以区别对待和处理，通常仪器分为二大类错误，一类是严重的系统错误，这类错误将直接影响仪器的进一步使用，无法完成必要的工作，而不得不做更换、维修等处理；另一类错误较为轻微，属于提示、警告之类。这些错误由多种原因导致，同样可以有多种方法解决、应对，用户必须重视这些警告，才能保证测试数据的完整性、可靠性。当然，用户可以暂时忽略这些警告和提示，而不影响仪器的使用。

严重错误

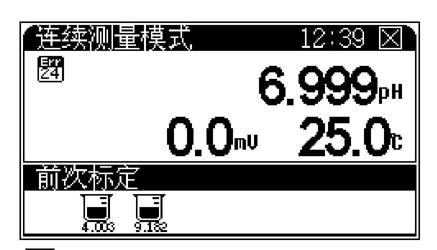
仪器发现严重错误时，将直接停机，并提示错误，此时用户除了关机外无法再进行任何操作。仪器的提示示意如图。

Err 02 IMPORTANT MESSAGE
If you see this message
first time,shutdown the
meter and try again.
If not you may calling
us for more help now!

警告错误

在使用过程中，由于电极本身、溶液本身或者操作本身等原因导致错误警告的出现，用户应重视这些错误提示，仔细阅读操作提示，并严格按照仪器说明书、电极说明书操作、保养和使用，将错误减少到最小。

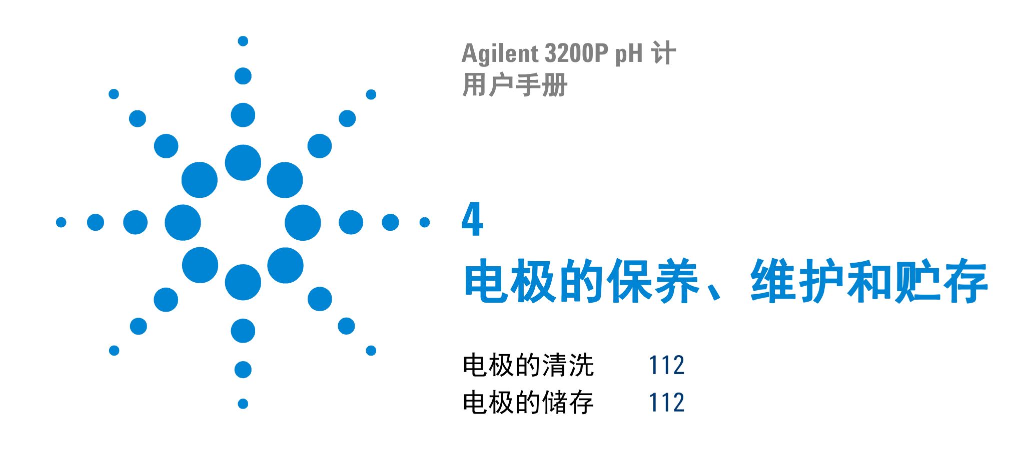
图示即为由于温度超出测量范围而出现的错误警告。



Err 24 为错误警告标志，数字表示错误代码，具体见下表的描述。注意：下表内容为多参数所有错误代码的描述，对应不同的仪器，用户查看相关内容即可。

表 1 表 错误警告代码表

NO	代码	描述	解决办法	备注
1	00	电导测量模块错误	联系代理商	严重错误
2	01	溶解氧测量模块错误	联系代理商	严重错误
3	02	温度测量模块错误	联系代理商	严重错误
4	03	数据存贮错误	联系代理商	严重错误
5				
6				
7	20	电位超出量程	更换电极	-1999.9~1999.9mV
8	21	pH/pX 超出量程	更换电极	-3.000~21.000pH
9	22	电导率超出量程	更换电极、更换溶液	0~2000mS/cm
10	23	电阻率超出量程	更换电极、更换溶液	0~100Mohm.cm
11	24	温度超出量程	更换电极、降低溶液温度	-6.0~120.0 ℃
12	25	溶解氧电流超量程	更换电极	0~4000nA
13	26	pH 电极斜率超范围	更换电极、重新标定	80~120%
14	27	无法识别 pH 标液	更换电极、设置合适的标液组、更换标液	
15	28	pH 标液温度超范围	降低标液温度	
16	29	重复标定同一种标液	更换标液	操作错误导致
17	30	选择的 pH 标液数已最大	先清除某个标液	最大标液数 5 个
18	31	pH 标液相互有冲突	先清除相邻标液	
19	32	到达最大存贮数据	可选择覆盖后，从头存贮	不删除全部数据
20	33	时钟电池电压过低	手动设置时间	
21	34	最大用户自定义离子数	删除不必要的离子	
22	35	最大存贮离子模式数	删除某个离子模式下的全部存贮数据	



4
电极的保养、维护和贮存

电极的清洗 112
电极的储存 112

本节描述电极的保养、维护和贮存信息。



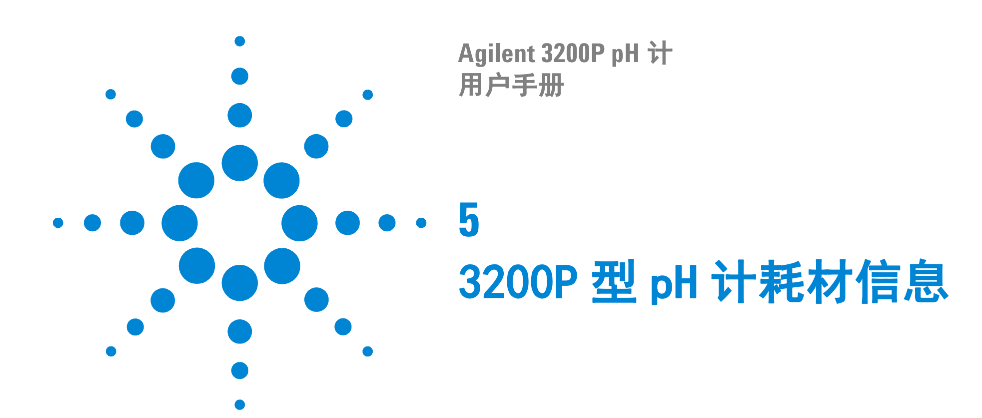
电极的清洗

对应不同的电极污染程度和污染物性质，电极的一般清洗方法，包括无机物清洗、有机物清洗、油脂类清洗、蛋白质沉淀清洗、玻璃敏感膜再生等等。通常进行一种或两种以上清洗后，用蒸馏水清洗电极外部，将填充溶液吸空，加满新鲜的填充溶液，如此重复 2-3 次。在 pH 电极保存溶液中浸泡至少一个小时。

电极的储存

不使用时，建议将电极存放在参比填充液中。对可充电极，将加液塞塞上。

长期不使用时，将电极放回盒体内室温保存。



5
3200P 型 pH 计耗材信息

此文档提供 3200P 型 pH 计的耗材信息，内容包括订货号，名称和描述。

订货号	型号名称	描述
G4388A	3200SA 型搅拌器	将电极支架和磁力搅拌器组合，能在较大的范围内对溶液进行稳定和精密的搅拌
G4389A	3200EA 型电极支架	用来安装各种不同电极的固定装置
5185-8389	电源适配器	输入：AC 100~240V ；输出：DC 9V/1A
G4388-27000	搅拌棒	搅拌器配套用
5190-3988	P3211 型 pH 复合电极	二复合电极、玻壳、可充式
5190-3989	P3212 型 pH 复合电极	二复合电极、塑壳、不可充式
5190-3990	P3311 型 pH 三复合电极	三复合电极、玻壳、可充式
5190-3991	P3111 型 pH 电极	玻壳，单电极
5190-3992	P3213 型 pH 复合电极	二复合、塑壳、可充式、平板
5190-3993	P3214 型 pH 复合电极	二复合、塑壳、不可充式、锥形、
5190-4003	R8111 型参比电极	玻壳、陶瓷砂芯、 Ag/AgCl、单盐桥式
5190-3999	ORP8211 型 ORP 电极	二复合电极、玻壳、可充式
5190-3998	T7111 温度电极	不锈钢外壳， 测量范围 0 ～ 100 ˚C
5185-8390	ATC 温度诊断工具	温度诊断



订货号	型号名称	描述
G4383-40000	短路插头	用于仪器零电位校正和电位值诊断
5190-0533	pH 缓冲试剂套装	瓶装溶液， 3X250mL， 4.01、 7.00、 10.01 pH
5190-0534	pH 缓冲试剂套装	瓶装溶液， 3X250mL， 4.00、 6.86、 9.18 pH
5190-0541	pH1.68 缓冲试剂	瓶装溶液， 3X250mL
5190-0538	pH4.00 缓冲试剂	瓶装溶液， 3X250mL
5190-0535	pH4.01 缓冲试剂	瓶装溶液， 3X250mL
5190-0539	pH6.86 缓冲试剂	瓶装溶液， 3X250mL
5190-0537	pH7.00 缓冲试剂	瓶装溶液， 3X250mL
5190-0540	pH9.18 缓冲试剂	瓶装溶液， 3X250mL
5190-0536	pH10.01 缓冲试剂	瓶装溶液， 3X250mL
5190-0542	pH12.46 缓冲试剂	瓶装溶液， 3X250mL
5190-0545	参比填充液	瓶装溶液， 3X30mL

备注： Agilent 建立了一个客户门户网站，可为您所拥有的产品提供详细的相关信息。该门户网站的登录地为 http://www.agilent.com/chem。

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Printed in China 03/2012
First Edition, March 2012



5973-1775

